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Electrical World

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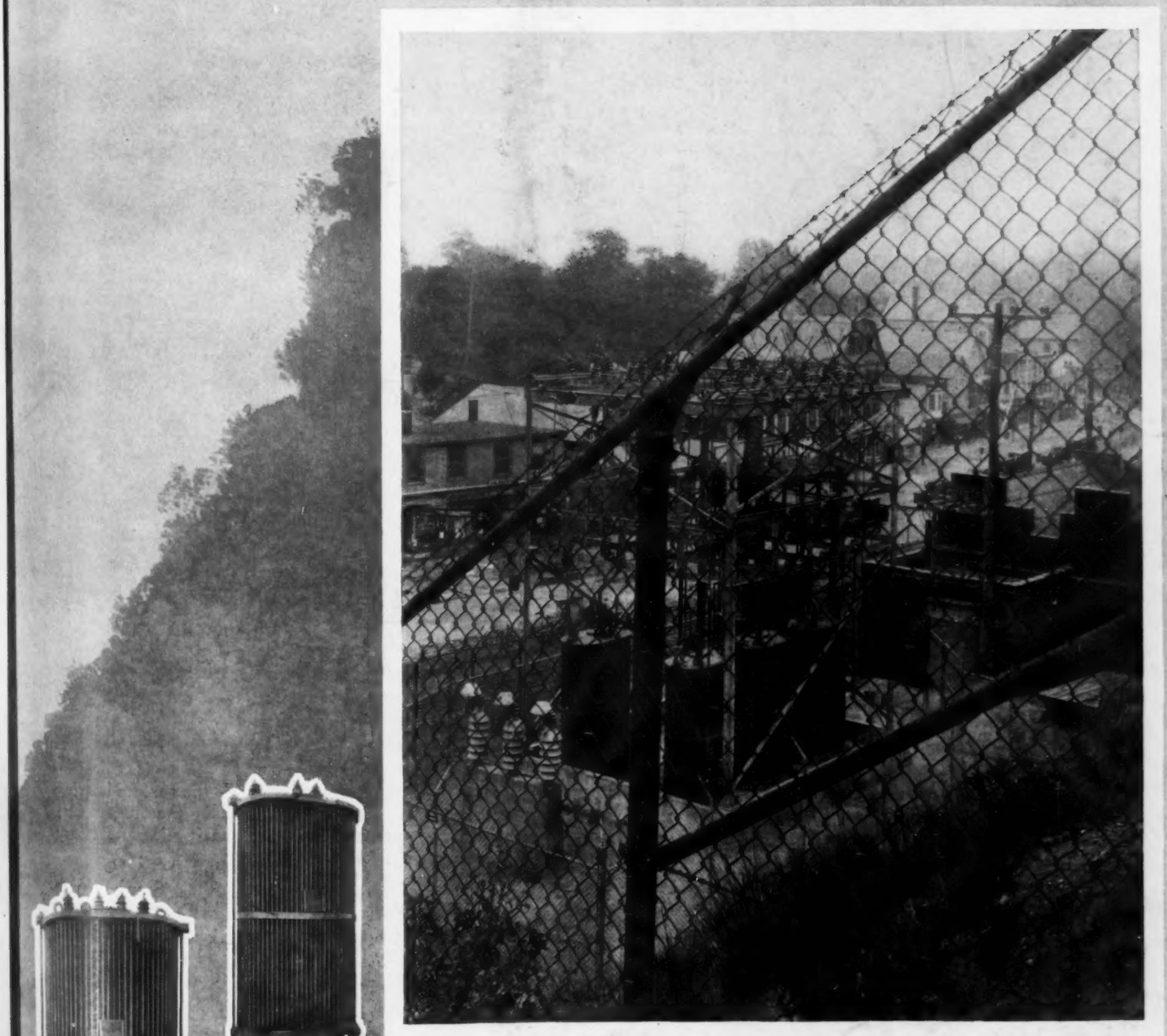
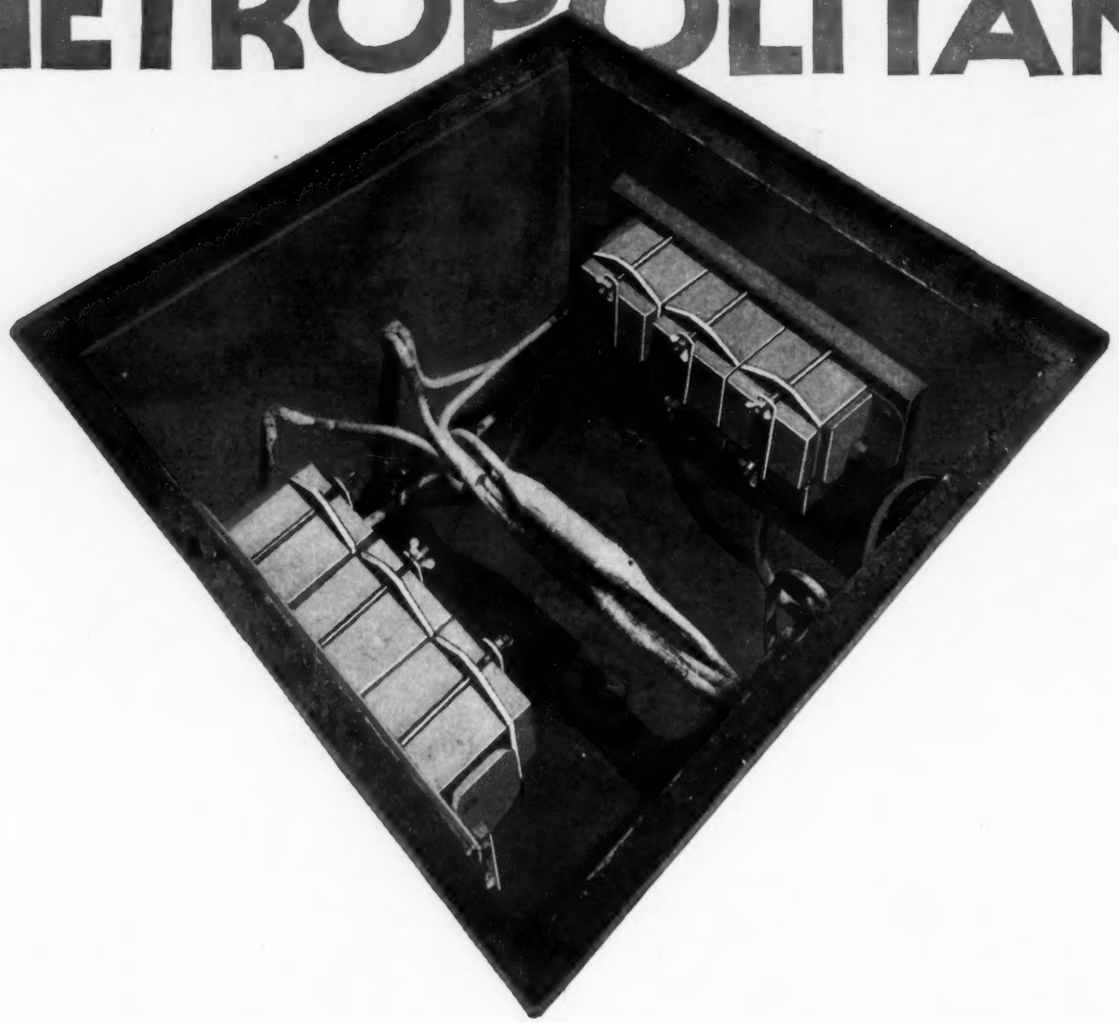


THESE two Packards are part of the picture, for they are being installed in this substation at the works of the American Hard Rubber Company at Butler, N. J., on the lines of the Jersey Central Power and Light Company.—*General Engineering and Management Corporation, Engineers and Managers.*

THE PACKARD ELECTRIC COMPANY, WARREN, OHIO

Packard is never seen, except on goods of honest value

METROPOLITAN



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Electrical World

Published by McGraw-Hill Company, Inc.
W. H. ONKEN, JR.
Editor

VOLUME 86 — *New York, Saturday, October 3, 1925* — NUMBER 14

Making Conventions Pay Higher Dividends

WHAT is the test of a good convention? Above all else it must be the flow of fresh ideas into open minds, creating a more effective intellectual "head" and developing higher working powers in the doing of the daily task. In an industry like the electric there is small excuse for a poor convention, for the wealth of topics which it offers for discussion grows from year to year. Any tendency to overcrowd the program cuts down the opportunities for free and informal battles of opinion, and convention efficiency then suffers. Colorless advance programs repel attendance, and the appeal of personality and reputation is needed to stimulate a real interest.

Organization is carried to such a pitch in these days that it is necessary to guard against too much routine, in regional programs particularly. Fortunately the practice of merely summarizing committee reports is rapidly increasing in favor. As committees increase it may become necessary to read the printed reports by title only in order to allow time for their discussion. Announcements that such reports are to be on the program may well bring out one or two live subjects included in the text or present a challenging conclusion to attract disputants. The industry must get away from the chilling influence of routine and organizational structure in putting out and carrying through programs for periodical meetings. Instead of saying that at a certain hour the committee on prime movers will present its report, for example, why not say something like this: "11 a.m.: Prime Movers—mercury boiler versus high-pressure steam turbine; hydraulic turbine tests, etc."

Let the regional associations capitalize the reputations of speakers and discussion leaders in their convention announcements and run their meetings on schedule time even if only two or three are gathered together in the name of electrical progress. It is surprising how soon the news that a meeting has started will speed along hotel corridors, especially when accelerated by one or two of the chairman's lieutenants. In the perfectly natural quest for relaxation it is not the easiest task in the world to keep a regional convention hard at work amid beautiful surroundings, but a wisely balanced program goes a long way toward accomplishing this in such a manner that the delegate goes home with new enthusiasm for his work and enduring memories of friendly contacts in hall and field which help powerfully to maintain the esprit de corps of the industry in every-day life. A worth-while convention should have a meetings program equally attractive with and far more valuable than the golf, dance, tennis and amusement program. There is too much to be done in this industry to permit of any relaxation in the caliber of convention working programs.

Disagreement About the Theory of Transmission-Line Stability

TWO papers dealing with the stability of transmission lines evoked a lively discussion at the recent Pacific Coast convention of the American Institute of Electrical Engineers in Seattle. Although the authors of these papers attempted to deal with the subject only in a preliminary way, the papers show that there exists an apparent difference of opinion. Such difference of opinion augurs well, however, for where investigators disagree the solution of a problem may be expected much sooner than when they are all working on the same theory.

The authors of one paper feel that static stability is the proper avenue of approach, while the author of the other contends that transient stability is the more important. In any event the whole discussion seems to range around the excitation of synchronous apparatus, particularly the generator fields. Instability may occur in transmission lines below the economical power limit of the line if the field on the generators under static or normal conditions is too weak when transient conditions arise, such as the tripping out of one of two parallel lines, sudden increases of load, short circuits and grounds. If it were possible to increase the field strength rapidly enough under such conditions, instability of the line could be prevented.

Several means have been suggested for strengthening the generator field suddenly under transient conditions, such as, for instance, designing a quick-acting field regulator, increasing the speed of prime-mover governors, changing the characteristics of generators and exciters, connecting a reactive load to the generator to compensate for some of the leading current of the transmission line, thus permitting more generator-field excitation. Many of the suggested remedies offer possibilities, but, like the old question of the grounded neutral and other problems that have arisen from time to time, the answer to the stability question will probably be found in a mass of accumulated operating data.

Why Not Exhibit More Industrial Electric Heating Equipment?

IF "OUT of sight is out of mind," why should any central-station manager wonder at the abysmal ignorance of many industrial power customers as to electric heating apparatus now available, Adequate displays of heavy-duty furnaces, ovens, etc., in the downtown offices and electric shops of central-station companies are rare indeed, and only occasionally does one see even the smallest devices for process applications exhibited outside a convention of heating specialists, barring soldering irons and glue pots. Doubtless one reason for this is the large amount of specially designed equipment required in this fast-developing

field; but to offset this there is now a vast amount of practically standard apparatus available for business heating demands, and it is a pity to make so little apparent effort to display it in places where the general public can examine it as freely as the household appliance. A good many managers appear to overlook the value of this load because only a small percentage of the people who visit the office or electric shop are likely to be interested in industrial electric heating. It takes few sales, however, to add an amazing volume of load to the system in comparison with the ordinary household apparatus, and a little active attention to well-selected displays should yield far-reaching results.

Nineteen Years of the Illuminating Engineering Society

LOOKING backward over the nineteen years of existence of the Illuminating Engineering Society, a perspective embracing various phases of interest is obtained. In the earlier years the papers presented before the society were largely confined to theoretical considerations. Out of this early period there developed a viewpoint of the extent to which lighting is influential in the world's activities. Now this is bearing fruit in the form of many papers of great practical interest. Moreover, as lighting men have themselves become convinced of the great part that lighting can perform in the world's work and in human happiness, the desire to educate the consumer has greatly increased. It is not surprising, therefore, that at the Detroit convention of the Illuminating Engineering Society, reported in last week's issue, there was much interest in educational movements and in papers and demonstrations prepared from the more practical points of view.

The lighting specialists of central-station companies contributed an interesting session showing the increasing effort toward better lighting that is being directed by such organizations. In this particular session industrial and purely commercial lighting were chiefly discussed, and virtually nothing was said of the great commercial possibilities of residence lighting. Interest in the industrial lighting campaign which is now under way was made evident by various papers and discussions. A number of fundamental and practical papers on lighting for workplaces provided much of value.

Automobile headlighting and traffic-control systems came in for their share of attention. Street lighting also was well represented on the program. These discussions reflected the importance of lighting on the streets and highways. Another session, lasting half a day, was devoted to daylighting and to the mixture of artificial and natural light. In fact, the variety of foundational scientific papers indicates that the society is in a healthy condition and that it is performing a function for which it is peculiarly adapted. That is, it is a forum, quite free from commercial bias, for the presentation of papers and discussions pertaining to the production, measurement and utilization of light. All in all, it may be said that utilization received by far the most attention. This is the natural consequence of the progress in knowledge of light and lighting. In the papers presented the central-station companies are provided with much data for the foundation of lighting revenue.

Some Impressions of the Electragists' Convention

THE annual convention of the Association of Electragists International at West Baden Springs last week was a notable one. The continuing trend in the electrical industry toward greater centralization of central-station buying seems to be stimulating increased interest in the contractor-dealer on the part of the jobber. Steady expansion of the league movement and the local institution of the "red seal" program are undoubtedly encouraging to both the jobber and the manufacturer, who look to the contractor for a good part of their market. The present unprecedented concentration of interest by the electric light and power companies on the subject of market development, under the leadership of President Davidson and Commercial Section Chairman Lloyd of the National Electric Light Association, is bringing new hope of an intensified merchandising activity that cannot fail to benefit the dealer. All this, combined with the conspicuous progress which has been shown by the Electragists' association in the last few years in establishing constructive policies and purposes, accounts for the larger attendance and wider attention.

The great need is still for members in the association. There are about twenty-five thousand men who work as electrical contractors — this, of course, including the ubiquitous "curbstoner." Less than 10 per cent of them are in this national association of contractor-dealers. Jobbers and manufacturers can well afford to give serious effort and attention to helping to build up this membership, in order that more of the men who install wiring and equipment and sell appliances may come under its influence.

Short Radio Waves Over Long Distances

SINCE the early days of radio transmission one of the most important and elusive questions has been the nature of the medium transmitting radio waves and the explanation of the way the waves follow the surface of the earth. Fundamental theory is very definite in regard to the method by which an electromagnetic disturbance is radiated in free space and as to what happens to electromagnetic waves when they hit the surface of a conductor. The predications of theory, however, are not by any means closely met in the case of radio waves near the earth, and, as is well known, these rays follow the curvature of the earth's surface in a very remarkable way, and in a very fortunate way from the standpoint of the possibilities of radio communication.

Radio engineers and physicists have invoked as explanation the Heaviside conducting layer in the upper atmosphere as a reflecting surface which always throws the radio waves extending out into space back onto the earth. While this has appeared plausible and helpful, it has done little more than serve as a general explanation without complete confirmation. Recent experiments on the transmission of relatively short radio waves for distances up to 10,000 miles have seemed to confirm the theory that the Heaviside layer is an important factor. These experiments have concerned themselves with the change in the value of received signal with the distance from the transmitter. Apparently, for the shorter wave lengths, the intensity

of the received signal decreases with increasing distance from the transmitter up to one hundred miles or so, when the signals can no longer be observed. For greater distances, however, after a region of silence a point is reached where the received signal becomes strong again and rises rapidly to a maximum, thereafter decreasing slowly once more. The silence region is known as the "skip distance" and varies with the wave length. It is roughly 400 miles for a wave length of 32 meters and 1,300 miles for 16 meters.

In a recent number of *Science* the simple theoretical explanation of these facts is offered that two portions of the propagated wave from the transmitting antenna are active in these regions. One portion clings to the surface of the earth, decreasing rapidly in intensity with the distance until it is lost, and the other portion moves in an upward direction and is reflected from the Heaviside layer. The complete explanation is by no means simple as it involves the relation between the plane of polarization of the electric vector and the critical frequency of motion of electrons in the Heaviside layer. Some account has to be taken of the fact that the optical constants of the air merge gradually into those of the Heaviside layer, which cannot have sharply marked limits. Nevertheless, the theory has been worked out in some detail, and studies of the variation of the "skip distance" with the wave length seem to strengthen greatly this view of the nature of the process of radio transmission.

Ground-Floor Appliance Selling

IN ALMOST every city there are instances where the sale of electric ranges and refrigerators to new apartment houses as well as single homes has been prevented because the salesman did not get on the job before construction had started or proceeded to a point where the cost of installation would not be excessive. Not all of this business was lost, because many builders, recognizing the added value of this electrical equipment, have been willing to go to the necessary additional expense to make electric cooking and refrigeration standard in their buildings.

It is, however, of importance to the central-station company that the new houses and apartments now being built should represent so far as possible the last word in electrical convenience. This is desirable not alone for the revenue to be obtained from the newer installations, but because the equipment of such homes represents a standard to which houses ten or fifteen years old will be raised. The more new residences and apartments that can be completely electrified during construction, the more urgent it will become for the owners of houses already built to bring their homes up to an equal level of convenience.

Many national and local campaigns to popularize electrical homes and emphasize the importance of adequate wiring have been staged. These are bearing fruit and will continue to do so. But it is doubtful whether anything is more efficacious than selling by personal solicitation. Central-station commercial department heads ought therefore to urge salesmen to canvass the situation early and often where new homes are being built. It doesn't make much difference whether the central-station company itself sells the electrical equipment—the point is to get it sold and installed before all of the owner's money is spent for something else.

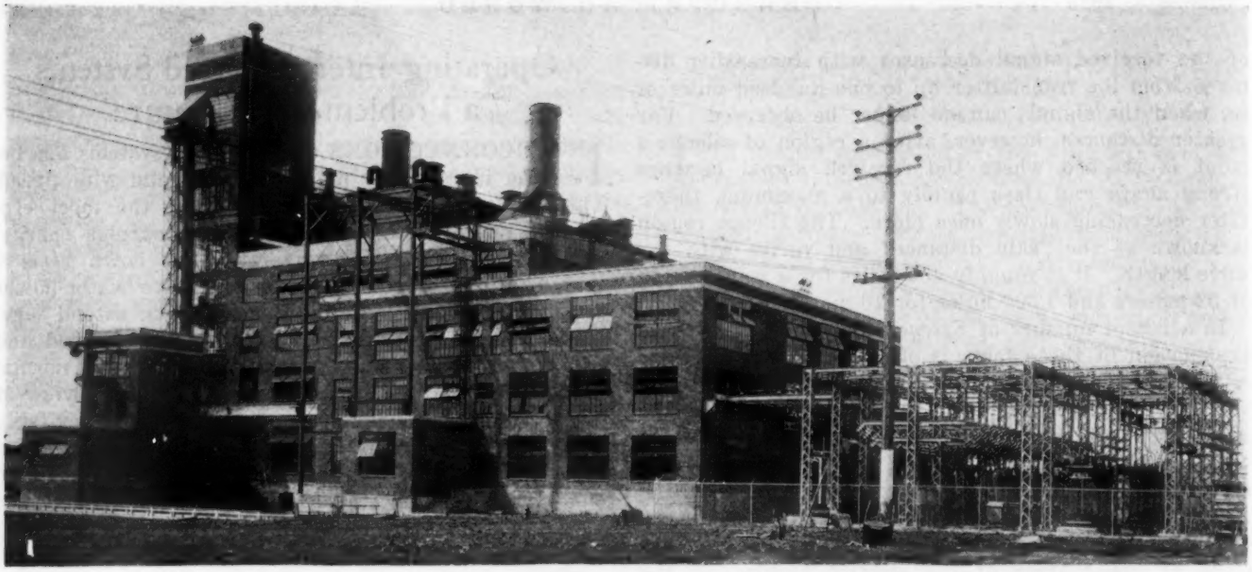
Operating Interconnected Systems a Problem of the Future

INTERCONNECTIONS of plants and systems are becoming increasingly more numerous and widespread. Their avowed purposes are to permit the most economical operation of plants, exchange surplus energy, take advantage of load diversity, cut down reserve equipment, make possible more extensive water-power development, delay building of new plants, extend service and increase reliability. If properly equipped and laid out, an interconnected system can, under normal conditions, give all of these advantages; but, in view of the occasional failures of equipment which inevitably occur and the added possibilities of transmission interruptions between stations resulting from lightning, wind, snow and sleet storms, is it certain that the advantages just enumerated can always be counted upon, especially at the time they are most needed?

This note of warning is sounded, not to belittle interconnections, which are the greatest single factor in development of the electric service industry, but to emphasize the importance of effective relays to isolate faults, clear troubles and restore service, and especially the necessity of eliminating obstacles to the flexible handling of a system by the system operator. Perfect relay operation alone may not assure the best service, because the sudden cutting out of a section of line by a relay may prevent transmission of the needed power to a section not within the zone of trouble, or it may disturb the load distribution between stations adapted for economical operation. The first happening may hazard the service to one or more communities, and the second will reduce the system economy until normal conditions can be restored.

Of course, these possibilities may be reduced by means of loop or ring systems or interconnections at various points, but the human element in maintaining reliable and economical service is still a major factor. As pointed out in the article "Operating a Fully Interconnected System," appearing in this issue, the system load dispatcher can function efficiently in performing his tasks of load allocation and the maintenance of reliability only if he be provided with a system which is flexible under abnormal conditions and be not hampered with any avoidable limitations. Study of the way in which the Consumers Power Company of Michigan enables its system operator to allocate loads on generating stations, modify these plans for changing conditions, presectionalize its system before storms, clear trouble and restore service should help any operating company.

More difficult to operate than an interconnected system under one management, however, is an interconnected system of several separately owned systems, such as is found in Ohio. Added to all the problems of the Michigan system are those of inducing the chief operators on the separate systems to do what is best for the combined systems and of complying with all the terms of contractual relations without hazarding reliability or economy of operation. Since more interconnections of the type in Ohio will be made, a knowledge of methods of operating such systems from a dispatcher's viewpoint will aid the entire country in the solution of operating problems and will perhaps give engineers and executives new viewpoints on what should be avoided in future interconnections to make them operate most effectively when they are most needed—under abnormal conditions.



New Sioux City Station in Service

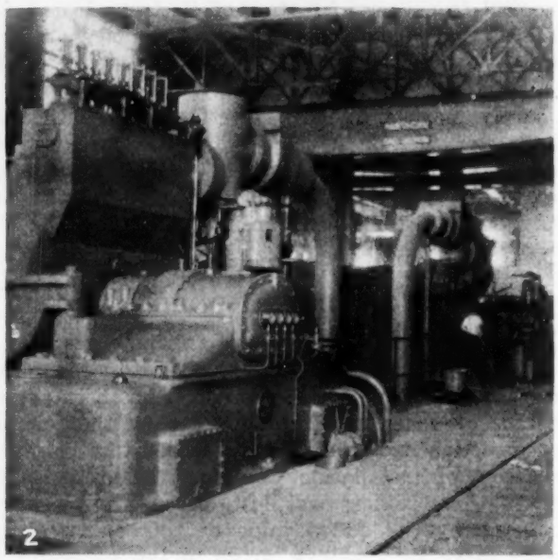
THIS station has been designed to supplant two older plants in Sioux City and in addition will supply energy over 33,000-volt transmission lines to the Iowa Light, Heat & Power Company, which was recently acquired by the United Gas Improvement Company and serves the territory to the east of Sioux City.

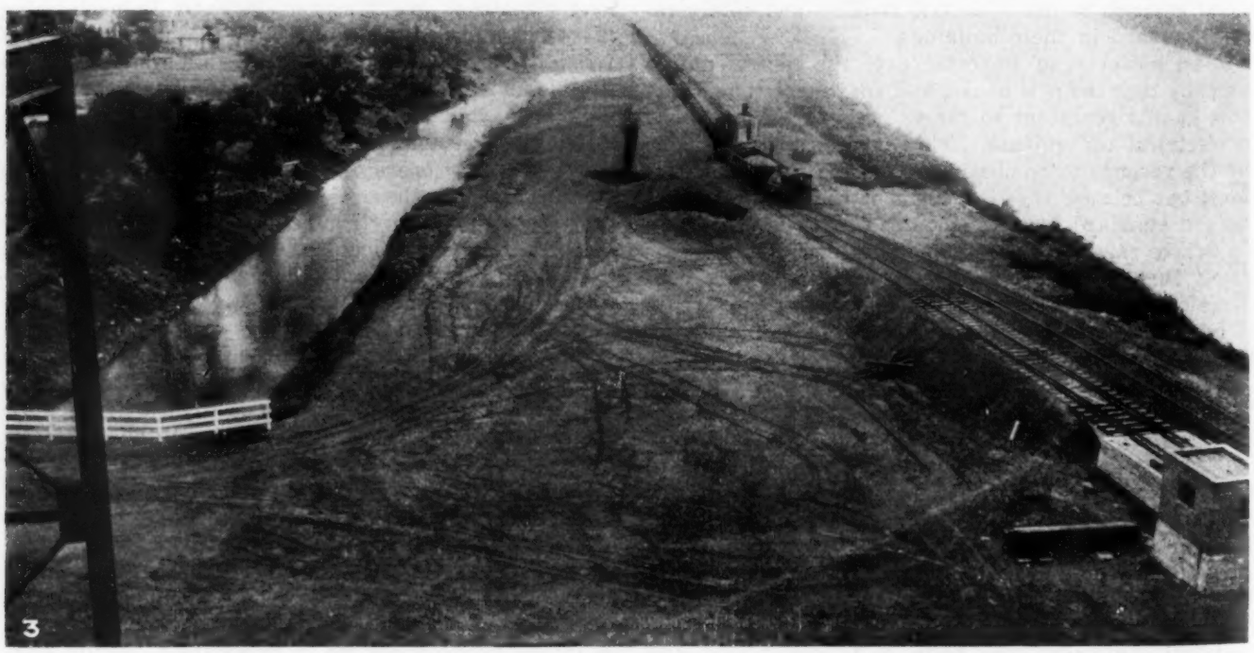
Pulverized fuel is used, and the whole station has been designed to operate at the reasonable efficiency of 17,000 B.t.u. per kilowatt-hour output with a minimum investment tied up in plant equipment.

Fig. 1—The new plant of the Sioux City Gas & Electric Company, showing the 33,000-volt switch yard and the coal-handling tower.

Fig. 2—Main turbine room, with the two 10,000-kw. units now in operation.

Fig. 3—Ample coal storage is provided. Two locomotive cranes handle the coal, one on tracks and the other on caterpillar treads in order to spread it.





Features of the New Sioux City Station

Big Sioux Plant of Sioux City Gas & Electric Company Designed to Operate at 17,000 B.t.u. with Minimum Investment—Will Carry Load of Sioux City and Surrounding Territory

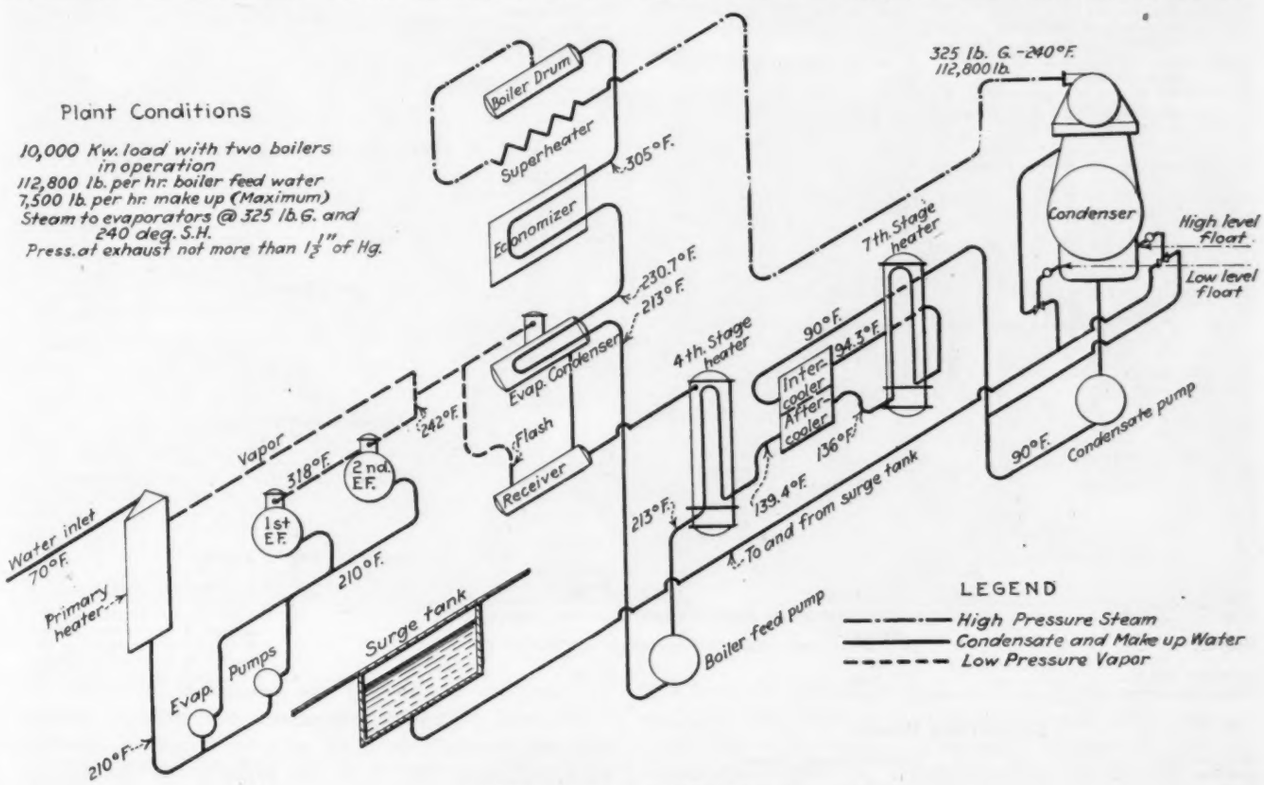
By K. M. IRWIN
Mechanical Engineer, Electrical Department, United Gas Improvement Company

THE Big Sioux station of the Sioux City Gas & Electric Company, which was put into operation during June, 1925, was built to carry the entire lighting, power and railway load in Sioux City and the territory east of Sioux City for a distance of more than one hundred miles. The present capacity is 25,000 kva., with an ultimate capacity of 75,000 kva. Due to lack of condenser water supply, additional power-generating equipment had to be located on a new site instead of extending either of the two existing plants which depend on deep wells for cooling water.

A study extending over several years was made of various possible sites on both the Missouri River and the Big Sioux River. The Big Sioux River site was chosen because the river has well-defined banks, relatively clear water, and good transportation and housing facilities. The bed of the Missouri River at Sioux City is exceedingly wide and with the recession of each year's high water there is no certainty as to where the main channel will settle. The mud difficulties that have been encountered at other stations on the Missouri and the fact that the only available site on the Missouri was some distance from the trolley line, with poor roads and no houses, were determining elements in the choice of the Big Sioux site.

As this station will be the sole source of power for the district and the older stations will be maintained only for reserve capacity, it was decided that the investment for the first step should be kept at a minimum, in order that the company could earn a reasonable return on the total investment of the plant, including previous expenditures on the two older stations. The new station will also have the load factor of the system in place of a base load, which further limited expenditures for economy equipment. The plant was therefore designed for an operating efficiency of 17,000 B.t.u. per kilowatt-hour. The equipment necessary for a lower B.t.u. consumption on the size and type of load would have proved too costly to show a reasonable return on the investment. The use of air preheaters was considered and the design made so that they can be installed at a later date. Economizers equivalent to 38 per cent of the boiler surface, steam pressure of 355 lb. and a total temperature of 675 deg., together with two stages of bleeder heating, were included, as they amply justified the investment necessary.

The pulverized-fuel method of coal firing was chosen because, in this district, fuels of a widely varying quality are available, and, in order to enable the plant to take proper advantage of the fuel market condi-



PLANT HEAT BALANCE DIAGRAM

tions, it was deemed advisable to adopt this method of firing, as the designers felt that no form of fuel-burning apparatus that handles crushed coal could give, or be rapidly adjusted to give, uniformly high efficiency with these varying grades of coal. A very fine coal, or mine sweepings, which has at the present no market except in the local cement mills, is available at a favorable price, and it is impossible to utilize this fuel for combustion under steam boilers, except in pulverized form. In the few weeks the plant has been in operation it has been found that a higher boiler efficiency by at least 5 per cent has been attained than

TABLE I—DATA ON PRINCIPAL EQUIPMENT IN BIG SIOUX STATION OF SIOUX CITY GAS & ELECTRIC COMPANY

General

Location of plant	Sioux City, Iowa
Character of service	Light, power and railway
Capacity, present building, kva	25,000
Ultimate kva	75,000
Boiler house, ft	100x81
Turbine room house, ft	59x81
Control house, ft	26x101
Mill house, ft	22x81
General contractor	The U. G. I. Contracting Co.

Boilers, Superheaters and Economizer

Manufacturer	B & W Boiler Co.
Type of boiler	Stirling, 4 pass.
Number installed	3
Steam-making surface per boiler sq.ft	11,124
Furnace volume, cu.ft	7,810
Sq.ft. of steam-making surface per cu.ft. of furnace volume	1.425
Size of tubes	3½ in. No. 8 gage
Boiler pressure, lb. gage	355
Superheating surface per boiler sq.ft	2,278
Ratio superheating to steam-making surface	1 to 4.88
Type of economizer	B & W Duratex
Surface, sq.ft	4,215
Ratio economizer surface to steam making surface	1 to 2.64
Steam temp. at 200 per cent rating, deg. F.	677
Corresponding superheat, deg. F	240

Fuel

Kind	Iowa
Heat value, B.t.u. per lb	10,000 on dry basis

Pulverized Fuel Equipment

Mills	Raymond
Nominal capacity	6 tons
Number of mills	3
Driers	Lopulco
Surface, sq.ft	288
Number	3
Conveying system	Fuller-Lehigh
Number of pumps	3
Capacity, tons per hour	6
Burners	Lopulco
Number of burners per boiler	7
Drive	7½ hp. d.c. motor, 400-1,600 r.p.m.

Stacks

Number	2
Type	Self-supporting steel, lined full length with gunite
Height	74 ft. above roof, 99 ft. above burner floor
Diameter, inside	3 ft. 9 in.
Boilers per stack	2

Boiler-Feed Pumps

Manufacturer	Cameron steam pumps
Number	3
Type	Centrifugal, two 6-stage 740 ft. head, one 4-stage 990 ft. head.
Capacity	600 gal. per min.
Drive	2, G. E. 200 h.p. motors—1 Terry steam turbine, 250 hp.

Evaporator

Manufacturer	Griscom-Russell Company
Number	1
Type	High pressure, 2 effect
Capacity	7,500 lb. per hour

Bleeder Heaters

Manufacturer	Griscom-Russell Company
Surface, sq.ft	4th stage 505, 7th stage 455

Coal Handling

Type	Belt conveyors and skip hoist
Furnished by	Link-Belt Company
Capacity	40 tons per hour
Crushers, number	1
Crushers, make	Link-Belt Company
Coal distributed in raw coal bunker	30 in. belt conveyor equipped with tripper
Method of reclaiming from storage	Locomotive crane
Manufacturer	Ohio

Main Generating Units

Manufacturer	General Electric Company
Capacity, each	11,250 kw. at 90 per cent power factor
Number of Units	2 (present)
Throttle pressure and temperature	325 lb., 675 deg.
Type of generator	3-phase, 60-cycle, 6,600-volt
Ventilation	Closed system with Griscom-Russell Co. U-fin air cooler

Guaranteed performance of turbines:
Steam condition 325 lb. gage, 240 deg. F. superheat, expanded to 28.5 in. vacuum.

Load, Kw.	Lb. of Steam per Kw.-Hr.
5,000	11.7
7,500	11.0
10,000	10.8
11,250	10.85

Surface Condensers

Manufacturer	Westinghouse Elec. & Mfg. Co.
Number	2
Tube surface, each, sq.ft	17,000
Sq.ft tube surface per kw. of generator rating	1.51
Connection to turbine	Rigid
Support	Springs
Condenser tubes	Scovill Mfg. Co.

Circulating Water Pumps

Manufacturer	Westinghouse Elec. & Mfg. Co.
Number of condenser	2
Speed	490 r.p.m.
Capacity, gal. per min, one pump	11,000 against 15 ft. head
Capacity, gal. per min. two pumps	19,000 against 23 ft. head
Drive	550 volt, 75 hp., a.c. motors

Air Ejectors

Manufacturer	Westinghouse Elec. & Mfg. Co.
Number per condenser	2
Type	Jet with inter and after cooler
Steam consumption	1,300 lb. per hour
Capacity	34 cu.ft. of 70 deg. free dry air at 28½ in. vacuum

Condensate Pumps

Manufacturer	Cameron Steam Pump Works
Number per condenser	2
Type	Cameron centrifugal, 2-stage
Capacity	300 gal. per min., 300 ft. head
Drive	Variable speed, 550 volt, 60 hp., a.c. motors

Induced Draft Fans

Manufacturer	B. F. Sturtevant Company
Number per boiler	1
Capacity, maximum	110,000 c.f.m. of 550 deg. F. gas against 4 in. water pressure, or 90,000 c.f.m. of 360 deg. F. gas against 4½ in. water pressure
Drive	2 wound rotor motors, one 75 hp. and one 150 hp.

Screens

Screen wells, number	2
Traveling screens	Chain Belt Company
Width of each screen	11 ft. 6 in.

Miscellaneous Equipment and Materials

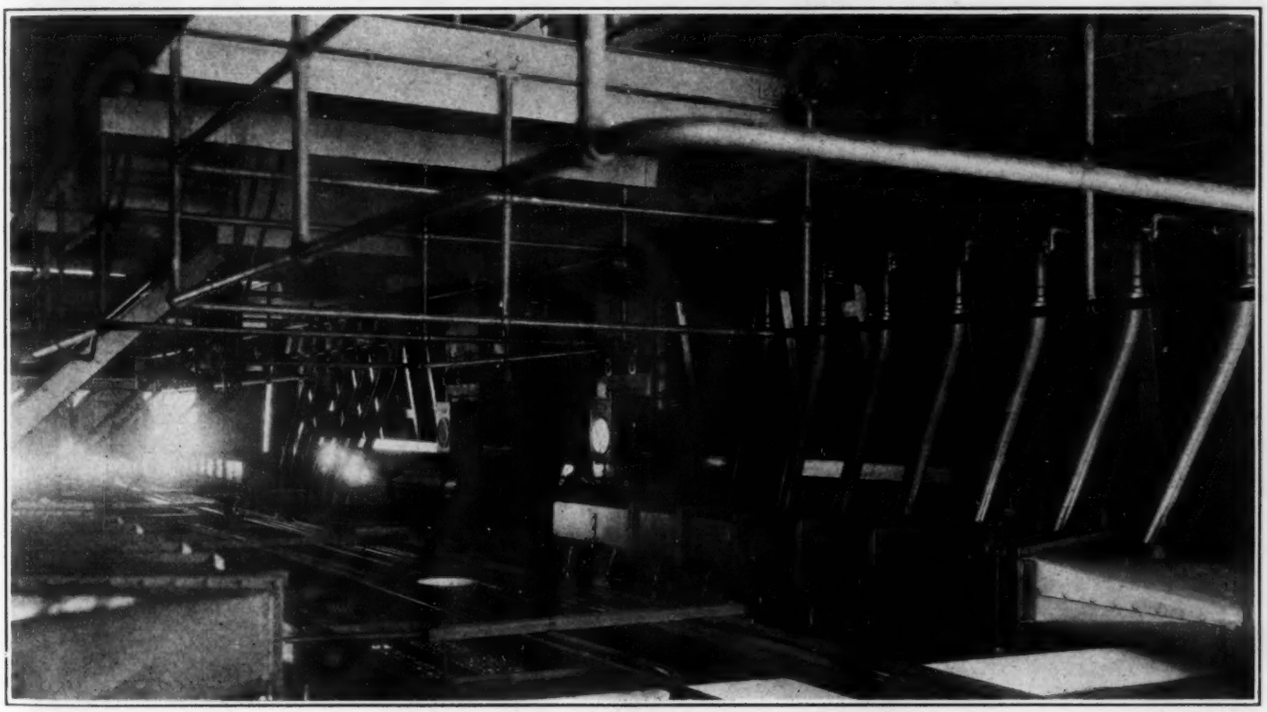
Building steel	Mississippi Valley Structural Steel Company
Steel sash and skylights	Detroit Steel Products Co.
Gratings	Arrowhead Company
Firebrick	Walsh Fire Brick Company
Sidewalls	M. H. Detrick Company
Arches	M. H. Detrick Company
Station crane	Northern Engineering Works
Soot blower	Diamond Power Specialty Co.
Sump pumps	Cameron Steam Pump Works
Bleeder heater pumps	Worthington
Fire pumps	DeLaval
Service pumps	Cameron Steam Pump Works
Air compressor	Ingersoll-Rand Company
Feed-water regulator	Copes
Oil purification system	DeLaval
High-pressure gate valves	Chapman
High-pressure globe valves	Crosby
Recording and indicator instruments	Taylor Instrument Company Foxboro Instrument Company Uhlings
Boiler meters and draft gages	Bailey Meter Company
Steam flow meters	General Electric Company
Boiler-feed water meter	Simplex Valve & Foundry Co.
Pipe covering	Johns-Manville, Inc.
Packing	"Cranite," The Crane Co.
Piping and fittings	The Crane Company
Load indicating and signaling system	The Cory Company

could have been attained with a stoker installation of either the underfeed or traveling-grate type. Fuel bed clinkering troubles have been eliminated.

COAL-HANDLING AND FIRING EQUIPMENT

All coal is delivered by rail and the plant is equipped with track scales. The present storage system consists of locomotive cranes, one on the railroad track and the other with caterpillar tread for spreading. The coal is dumped into a track hopper and from there elevated to a short distance above the ground level to the crushers by means of a skip hoist. From the bottom of the crushers coal is then raised to the top of the coal tower with a second skip bucket. It was necessary to break this coal handling into two steps due to the soil conditions, as quicksand is prevalent along the river bank and the expense of putting the crushers beneath the track hopper would have been materially higher than the plan adopted. This skip arrangement is unusual in that only one winding machine and one cable is used with the first skip bucket serving as a counterbalance to the second bucket. The power consumption and maintenance, therefore, are no higher using the double-lift arrangement than they would be with a single-skip bucket. The upper bucket discharges to a hopper which feeds the belts and these distribute the coal throughout the length of the mill building over the raw coal bunker, which is divided into three compartments. From the raw coal bunkers coal is spouted directly down through Wood driers, and from the Wood driers to Raymond mills. The whole mill house equipment is grouped into three parts. Fuller-Kinyon pumps pump directly from the discharge of the mill cyclones to the pulverized coal bunkers over the boilers. The raw coal bunkers have a capacity of ninety tons each, and the pulverized coal bunkers have a capacity of 75 tons each.

The boiler plant at present has three 11,120-sq.ft. Stirling class "P" boilers equipped with 4,215-sq.ft. economizers. These boilers are baffled four pass and the B. & W. type horizontal steel tube economizer is located beneath the fourth pass with a down gas circulation. The plant is so designated that when the load justifies the expenditure, air preheaters can be inserted in the uptake breeching from the outlet of the economizer and ahead of the induced draft fans. The induced draft fans are proportioned so as to take the additional resistance of the air preheaters. It is planned that the ultimate boiler plant will contain ten boilers of this size to supply six 10,000-kw. units. Steam pressure at the saturated drum is 355 lb. and superheat surface is installed to give a total temperature of 675 deg. at 200 per cent rating. The side walls and front wall of the boilers are of the Detrick construction, with air passages for the secondary air.



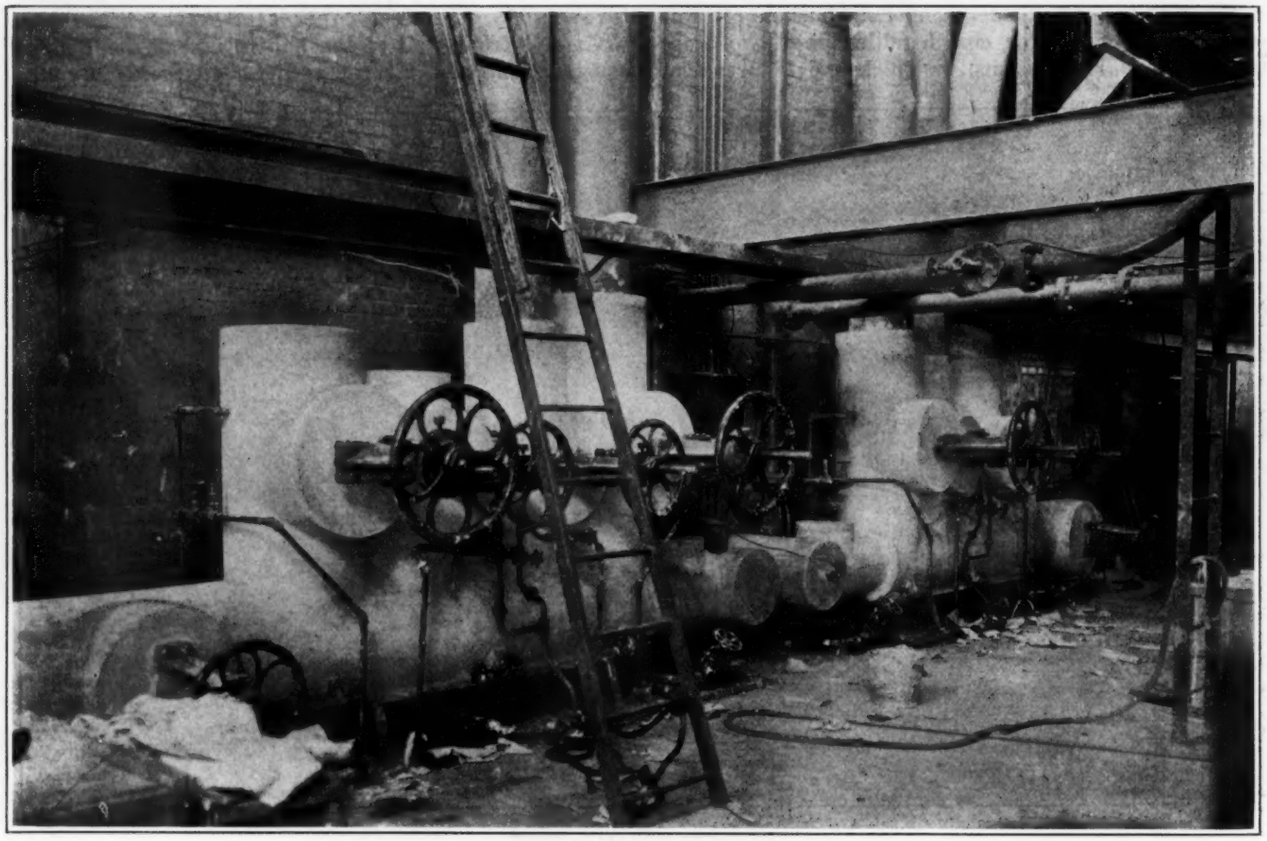
THE BOILER OPERATING FLOOR

The type of construction adopted is of the self-supporting type, each 2-ft. 6-in. belt of the wall being carried from the buck stays. The arch is also of Detrick construction and the operating floor is located above the arch so arranged that the top of the arch and the bottom of the operating floor form an air duct and the primary air for the burners is taken from the top of the arch. This serves the dual purpose of cooling the top of the arch and also eliminating the complication of bringing the primary air ducts up from the furnace bottom, which is a more usual type of installation.

There are seven burners driven by one direct-current motor for each boiler. The furnace bottoms are of the hopper type and ventilated, the air in these bottoms coming out into the boiler room. Each boiler is equipped with three air-operated ash gates, the ash being discharged into a sluiceway at the bottom and with a hearth screen that is 25 ft. down from the burner tips. The hearth screen is supplied at each end from connections from the mud drum of the boiler and ties back through the bridge wall with return bends into the bridge wall screen, the tubes of which are

carried up in the front bank of boiler tubes and again enter the circulation of the boiler in the front steam drum. In case difficulty is later encountered with side wall erosion, due to the type of ash, provision has been made to install side wall water screens, and the front steam drums of the boilers have been extended to make this connection possible.

Each boiler is equipped with a single induced draft fan of the double-width double-inlet type. The fans are provided with two motors, one of 25 hp., which will carry the load up to 250 per cent, and one of 150 hp., which will carry the load up to 350 per cent rating.



STEAM MANIFOLDS, SHOWING BOILER AND TURBINE CONNECTIONS AND CROSS-CONNECTIONS

The motors are of the wound rotor type and have external resistors. The smaller motor has twenty-one equal speed steps and the 150-hp. motor thirteen equal speed steps with an overlap of four speeds on the two motors.

The high-pressure steam piping, valves and fittings are in accordance with the new 600-lb. A. S. M. E. standard, chosen rather than the new 400-lb. A. S. M. E. standard, as the dimensions conformed more nearly to the practice in the other plants in which the United Gas Improvement Company is interested. The steam piping is all laid out on the unit system, two boilers supplying steam to a manifold and one turbine taking its lead from the same manifold. The manifolds are tied together with crossovers and the auxiliary lines are connected to all manifolds.

The turbines are arranged for two-stage bleeding and are 12,500-kva. General Electric nine-stage machines bled at the fourth and seventh stages. The steam end is designed to carry 12,500 kw. and the generators 11,250 kw. at 90 per cent power factor. The condensers are of the Westinghouse Electric & Manufacturing Company's radial flow type, with 17,000 sq.ft. tube surface and two circulating pumps at single speed. It was found with this particular combination of turbine and condensers that a net saving could not be accomplished by having two-speed circulating pumps, the increased steam consumption for lower vacuum which would be obtained by decreasing the volume of water being greater than the power saving realized by reducing the speed of the pumps. Each condenser is also equipped with a set of steam ejectors, which consists of two primary jets and two secondary jets, together with inter and after coolers. The coolers are piped up to use condensate, with the exception of one pass wherein circulating water is used for starting and at times of low load.

The condensers are equipped with hot wells, which are approximately 3 ft. deep and extend the full width and length of the condensers. Condensate pumps take their suction from the hot wells and pump through the bleeder heaters and inter and after coolers directly to the suction of the boiler-feed pumps. The boiler-feed pumps pump through the high heat level condenser of the evaporator system into the boilers. The boiler-feed pumps are driven by constant speed alternating-current motors and the condensate pumps by variable speed alternating-current motors. The quantity of water discharged from the boiler-feed pumps is controlled by varying the head on the suction, rather than by varying the speed or throttling the discharge, the variation in head being obtained by varying the speed of the condensate pumps. The regulator that operates the speed control on the condensate pumps is actuated by an

excess pressure regulator, which holds the boiler-feed water pressure at 50 lb. in excess of the boiler steam pressure. The advantage of this system is that the condensers were purchased with a definite guarantee of oxygen content per liter, which it was believed is below the point where danger from corrosion or pitting in the steel tube economizers or in the boilers can occur. It also lends itself to the elimination of elevated surge tanks, which are costly from a structural standpoint, and it also tends to make the evaporator installation flexible, as there is no fixed point of temperature and pressure going to the high heat level condenser, as is the case with an open-feed water installation. In order to supply the necessary reserve water capacity, the area between the foundation in the boiler room has been inclosed, making them into concrete surge tanks. In case the water level rises in the condenser hot wells, showing an excess in the system, it is possible to open a valve on the discharge of the condensate pumps so that they will discharge into the surge tanks. However, if the water level in the condenser hot wells falls, showing a deficiency of water in the system, a valve can be opened that admits water from the surge tanks into the top of the condensers. In this manner all water entering the system passes through the condenser.

In order to safeguard against an electrical interruption that would stop both the condensate pumps and the boiler-feed pumps and jeopardize the supply of water to the boilers, a turbine-driven boiler-feed pump, governed by a minimum-pressure regulator, has been installed, taking its suction directly from the surge tanks and discharging it directly into the boiler-feed header. It is therefore necessary for this pump to supply the full boiler-feed head, while the motor-driven pumps supply only the increment of head above that which is being supplied by the condensate pumps, so that at their maximum point of 600 gal. per minute the motor-driven boiler-feed pumps are supplying only 740 ft. of the total 1,040-ft. head.

The generators are equipped with Griscom-Russell U-fin type coolers, the source of water being directly from the condenser circulating pumps. With the two-stage bleeder heating, the additional thermal saving that might have been made by circulating condensate through this cooler was not sufficient to justify the additional expense and complication of piping up the two sources of supply. It would have been necessary to have circulating water available for this cooler at times of light load and during a season of the year when the vacuum was below 28 in.

All of the rest of the auxiliaries in the plant are motor driven and it is planned to install a house turbine that will float on the emergency bus as a synchronous condenser during ordinary operation and that will take up the load as a generator during an interruption to the house service.

All of the motors are alternating-current, 550-volt, with the exception of the 7½-hp. motors driving the pulverized coal feeders. These are 250-volt direct-current. The switching and substation is of the outdoor type, with the transformers stepping up from the generator voltage of 6,600 to 33,000 and tied directly onto the generator leads. The house service transformers then step down from the 33,000-volt bus to the 550-volt bus located in the service room inside of the building. From the 33,000-volt bus at present there are two feeders going to the older city plants that are used as substations.

No Saturation in California

An Interview with S. M. Kennedy Shows Prosperity of Southern California Edison Company—Active Plans for Load Building Are in Progress

THE foresight, enterprise and accomplishments of the Southern California Edison Company are well known in electric light and power circles the world over. Many have marveled at its growth and wondered when it would cease; but there are no indications of any let up in output and, as is well known, the construction program of the company is mapped out years ahead. During the last five years the number of customers and the business of the company have increased 100 per cent.

If there is any particular phase of central station operation for which the Southern California Edison Company is noted, it is the high development of its territory due to the necessity of finding a market for the output of its many excellent power stations, in a section of the country which, although growing fast, is still far from being densely settled.

The load factor of the Southern California Edison Company's system bears mute testimony to the excellence of its business-getting staff, headed by S. M. Kennedy, vice-president in charge of business development and public relations. This year's peak load, which was in excess of 400,000 kw., occurred in July at 10 o'clock in the morning and was occasioned by the overlapping of the irrigation, industrial and railway loads coupled with the heavy domestic load which the Southern California Edison Company has succeeded in building up.

Taking advantage of S. M. Kennedy's presence in the East, the ELECTRICAL WORLD inquired specifically about conditions in Southern California and what the commercial prospects are for the coming year. According to Mr. Kennedy business conditions are excellent on the Pacific Coast and the Southern California Edison Company has formulated plans for merchandising electric appliances in 1926 on a large scale.

MERCHANDISING PLANS FOR 1926

The plans include the sale and installation of 3,000 electric ranges, 2,000 electric water heaters for domestic boilers, 1,500 electric refrigerators for domestic use, 5,000 headlight heaters and a minimum of 20,000 lamp socket appliances of various types in use in connection with household work.

The company has already taken steps to increase its selling organization and will add 40 trained salesmen to introduce and sell the larger devices, such as ranges, refrigerators, etc. It is estimated by Mr. Kennedy that the additional income to be derived from the use of the appliances to be sold in 1926 will increase the gross revenue of the company by more than $1,000 a day.

Asked if a merchandise department should work on a profit-making basis, Mr. Kennedy replied as follows:

"There are two reasons why the sale of appliances should be conducted on a merchandising basis. The first reason is that the power company should co-operate with the dealer and not engage in unprofitable ventures. The second is that there should be a margin of profit, sufficient to cover at least the actual selling expenses of the merchandise distributed because it might be said that part of the burden of selling the appliances to some consumers had to be borne by other consumers not interested in the sale of these devices. The Edison company is strong for working with and co-operating in every way with the dealer and contractor.

"In order that the public may receive all the benefits to be derived from electric service there must be many ways for the public to obtain these electric appliances which lighten labor and bring joy to homes. The more channels available the sooner will the public be benefited. The contractor-dealer has opportunities which are peculiar to his business and the power company should realize that assistance given the dealer will benefit all concerned. Further, the more of such appliances and devices sold, the more work there will be for the contractor-dealer in the installation of wiring, fixtures and other materials to enable the appliances to be put in.

"For the larger appliances, such as ranges, washers, refrigerators and devices requiring technical skill, servicing by the central station company is necessary. The power company should have competent men for this work and thus can save the consumer unnecessary delay. Servicing should be done on a cost basis for time and material."

S. M. KENNEDY

Asked as to the prospective development of refrigeration as a domestic load, Mr. Kennedy replied:

"I am in the East making a close study of domestic refrigeration from all angles—manufacturers, central station and consumers. I have studied types, efficiency, rates, servicing and other details. It is my opinion the future holds no more promising or greater field for development for central station companies than domestic refrigeration. For climatic reasons central California and southern California are ideal fields for installations of this character. In that territory the ice man pays his visit practically every day throughout the year, and this is not the case in many other parts of the country where the winters are severe. The Southern California Edison Company plans to tell the story of domestic refrigeration to its customers and to make it easy for them to purchase and own a complete electric refrigerator. This will not be an extravagance on the part of the customer, as in reality it is a transfer of a part of the money paid the ice man to the electric company for refrigerating service. The refrigerating service will be better, cleaner and altogether more acceptable than the present method of refrigerating with ice."

"Is your range business satisfactory as a source of revenue?"

"Yes, we have 6,000 ranges on the system and we supply electricity to them on a combined schedule. The first 25 kw.-hr. is at the maximum lighting rate; the next 125 kw.-hr. is billed at a cooking and heating rate. This will care for the average consumption of an electric range; but all energy in excess of 150 kw.-hr. per month is billed at a still lower rate to encourage the use of water heaters and develop the room heating load."

"What are the possibilities of loads in your territory?"

"I can't see any saturation in the future. There isn't a store, a residence or an industrial plant connected to the company's circuits that couldn't use more electrical energy. There are always some useful appliances and new applications that will induce customers to use more electricity. On a per capita consumption basis the people of California probably use more electricity than those in other parts of the United States, and yet as time goes on it ought to be possible to double and quadruple the amount of electricity now used in every home. There should be no such word as saturation in the central station executive's or manager's dictionary. The electrical field constantly broadens, but there are no limitations to the uses of electric energy."

Berlin's Consumption of Electricity Is Increasing

THE use of electricity in the household in Berlin is gradually increasing, and at present approximately 30 per cent of the homes are electrified, according to reports reaching the Department of Commerce. The per capita consumption of electricity in Berlin is considerably less than in American cities.

Applications for new installations are now quite numerous, however, and the Berlin municipality is building a 200,000-kw. station to supplement the power stations at Zschornewitz and Trattendorf in the brown-coal districts approximately 60 miles south of Berlin.

It is not expected that this plant will be completed this fall, and consequently Berlin is threatened with a shortage of electrical energy during the winter.

Pacific Coast A. I. E. E. Convention

Papers on Stability Bring Out Interesting Differences of Opinion—220-Kv. Operating Experience Shows that Laws Governing Lower Tensions Apply—Papers on Distribution Show Planning for Higher Load Densities

THE fourteenth annual Pacific Coast convention of the American Institute of Electrical Engineers, held at the Olympic Hotel in Seattle on September 15-19, afforded the three hundred and fifty delegates who attended an opportunity to listen to a group of excellent papers dealing with some of the major problems before electrical engineers of the country today. Particularly notable, as already reported in the news columns of the ELECTRICAL WORLD, were the papers dealing with the stability of transmission lines and the problems of the engineer in designing distribution systems to meet the ever-increasing load densities in the larger cities.

Other noteworthy papers took up the subjects of high-voltage research, the relation of research to engineering education in universities, mechanical and electrical design of transmission lines and power-line interference with telephone circuits. A feature of the convention was an address made by President Pupin over the transcontinental telephone in which he stressed the responsibility of the engineer to play his part in human affairs. Those attending the meeting on Thursday evening listened to an intensely interesting address by Prof. K. B. Kirsten of the University of Washington on the "K B" propeller. This propeller is a new and revolutionary device for the propulsion of water craft of all types and is adaptable to airplanes and airships.

HIGH-VOLTAGE TRANSMISSION PROBLEMS

Any feeling that there is something mysterious about 220-kv. transmission which differentiates it from lower voltages was dispelled by the paper on "220-Kv. Transmission and Flashovers," by R. J. C. Wood of the Southern California Edison Company. On the contrary, two years' operating experience has shown that anticipated difficulties have not materialized and that 220-kv. lines are governed by the same laws that apply to lower voltages. Even flashovers, for which all sorts of complicated theories have been advanced, can be accounted for by one of two things—birds and lightning. Transients due to switching, short circuits and grounds have been shown by operating experience to cause insufficient voltage rise to produce flashovers and need cause no worry.

Various aspects of the question of stability or the power limits of transmission lines were considered in two papers on this subject, and although these papers were only preliminary to a more detailed discussion of the subject to be presented at the forthcoming mid-winter convention, they nevertheless showed that there is a tendency for students of the subject to get together on major premises. Discussion indicated that no one as yet has a full appreciation of the magnitude of the problem and further that the final solution must come from a mass of accumulated operating data.

The feeling was expressed that R. E. Doherty and H. H. Dewey in their paper overemphasized the matter of systems falling out of step from low generator field excitation, because experience has not shown such instances to have occurred. Moreover, it was contended that the authors failed to take full account of the most important factors by considering static stability instead of transient stability and furthermore that conclusions should not be drawn from shop tests. In criticism of C. L. Fortescue's paper it was pointed out that it is necessary to take into consideration not alone the characteristics of generators, regulators, exciters and prime-mover governors, but that excitation of the transmission line, synchronous condensers and synchronous motors must be taken into account as well.

There seem to be two schools studying the problem of stability, one contending that static stability is the basis upon which to work and the other that the all-important question is transient stability. Both agree, however, that generator-field excitation is one of the most important considerations. Long transmission lines require so much charging current that it is a serious problem to get sufficient excitation on the generator fields to maintain a high degree of stability on the transmission line during sudden changes of load. The present limitation is the inability of existing apparatus to respond quickly enough in providing the increased field necessary for the generators when more load is suddenly applied. The inertia of large systems seems to be great enough, however, to allow time for quick-acting regulators to provide the increased field necessary.

This brings out the point that the transmission line is not necessarily the limiting feature of a power system, but that the characteristics of generators, regulators, exciters, synchronous condensers, relays and circuit breakers are of equal importance.

HIGH-VOLTAGE RESEARCH

On Thursday morning a notable paper on "The Study of Ions and Electrons for Electrical Engineers" was presented by Dr. Harris J. Ryan of Stanford University. The paper gives the essential known facts about ions and electrons and was intended to excite discussion and show electrical engineers the necessity for becoming more familiar with electrons and ions for a better understanding of high-voltage electrical phenomena. The author expressed regret at the lack of proper terminology to express the behavior of ions and electrons and readily accepted the suggestion brought out in discussion that it would be preferable to say that electrons may be mobilized "mechanically and electrostatically" rather than "mechanically and electromagnetically."

In the discussion of this paper suprise was expressed at the new conception that air and oil are, after all, not really insulators, but that insulation is a property of the walls of the conductor by which electrons are confined that has been mistaken for the insulating properties of air and oil. It was pointed out that although air and oil may not be perfect insulators, they are nevertheless good insulators for all practical purposes

and are the mediums of insulation which must be dealt with and depended upon in actual practice.

ENGINEERING EDUCATION

On Thursday morning also were presented a group of papers dealing with engineering education and its relation to research in universities and colleges. In the presentation of his subject, "Engineering Research—An Essential Factor in Engineering Education," Dr. C. Edward Magnusson, dean of electrical engineering at the University of Washington, decried the tendency for large manufacturers and operating companies to take research away from the universities. Where universities expect to develop a strong research department it is necessary that there be a good instructor with marked research tendencies to conduct such work, he pointed out.

"The Relation Between Engineering Education and Research" was the subject of a paper by R. W. Sorensen, professor of electrical engineering at the California Institute of Technology. He stated that "research and engineering are inseparable, therefore research must be a part of engineering education," and that, "such being the case," a way must be found to include the former subject in engineering curricula. "Apparently this can be done only by extending the time required for engineering courses," said Professor Sorensen. He voiced the necessity for the electrical industry and operating companies to co-operate with engineering colleges in guiding them in the selection of research problems and to encourage those who can to provide the colleges with research funds to carry on this work. He felt that humanity studies in engineering courses are absolutely necessary if the student is to go forward to his life's work with the requisite training. All students in the institution he represents are encouraged to participate in football or some other form of athletics, and in his opinion such physical training is of the greatest importance.

Another paper dealing with the subject of technical schooling, entitled "A New Departure in Engineering Education," was presented by Harold Pender of the University of Pennsylvania.

TRANSMISSION-LINE DESIGN

Three papers were presented at different sessions dealing with the mechanical and electrical features of transmission-line design. A paper on the mechanical design of spans at supports at unequal elevation, by G. S. Smith, applied the catenary formulas to the solution of long spans in a practical way which lends itself to the use of a set of curves from which may be read all the physical data required for spans of a given length. Discussion of this paper showed that although there are some erroneous assumptions made in applying the catenary formula to transmission spans with supports at different elevations, it is nevertheless a great advantage to compute the physical constants of long spans by the simple catenary equation.

In the paper by F. K. Kirsten and E. A. Loew on "Transmission-Line Design" the authors worked on the assumption that in the design of a transmission line the maximum voltage for which the conductor is capable below corona is the voltage that should be used. They take exception to Kelvin's law by considering voltage as an additional variable factor affecting the most economical size of conductor to use. In the discussion of the paper the opinion was expressed that variable voltage was a wrong assumption to make, since the receiver voltage for any given line is fixed by other considerations and does not vary. It was pointed out that the value of lost power in the transmission line calculated by the authors was taken at about twice the figure that has been used in some cases and that if a lower cost were to be used it would materially affect results.

DISTRIBUTION PAPERS

A valuable symposium on distribution practice was presented in eight papers during the Thursday afternoon and Friday sessions. These papers deal with distribution practices and problems of the various systems throughout the country, and, most important of all, they showed that distribution engineering is an art in itself and is one which is finally receiving the recognition it deserves from the electrical engineering profession.

Every central-station company is confronted with the problem of handling higher and higher load densities, and it was gratifying to note that every distribution system discussed is being built after some kind of a carefully worked out plan looking to the future requirements of the community. It was made evident that the big problem of the distribution engineer today is planning for the future and to know how far ahead to plan and what load densities to assume. In some of the calculations made an ultimate of 19,000 kw. per square mile was assumed, and in other cases it was shown that load densities have already exceeded this value. In the congested districts of some of the larger Eastern cities, it was pointed out, the load is approaching a density of 200,000 kw. per square mile, and no one knows where it is going to stop.

The papers and discussion showed that systems are rapidly being changed over from 2,300 volts, delta, to 4,000 volts, four-wire, Y, in an endeavor to cope with increasing loads. Some engineers who discussed the subject favored even higher voltages, and it was brought out that the city of Los Angeles has already gone to 4,400 volts, delta, with the idea of Y-connecting this system later when load densities make it necessary. The consensus of opinion, however, as to the best distribution voltage seemed to be that it is preferable to stop at 4,000 volts and divide systems up into smaller units fed by automatic substations from 11-kv. to 33-kv. ring feeders.

Two papers were presented setting forth the problems of the telephone company in keeping up its standards of communication in the face of interference brought about by constantly increasing distribution voltages used by power companies. Discussion brought out the point that power men should know more about communication problems to aid them in promoting inductive co-ordination.

MISCELLANEOUS

Discussion on the paper by L. J. Corbett showed that all utilities on the Pacific Coast have taken cognizance of the radio interference problem and have taken steps to eliminate such cases of trouble as are traceable to their systems. Various meaus of locating faulty equipment were discussed, all indicating that definite progress is being made in devising effective methods of locating power-line disturbances. The most common method employed is the use of a sensitive loop receiving set, and some of the larger companies have assigned a man especially to the handling of such apparatus.

Operating a Fully Interconnected System

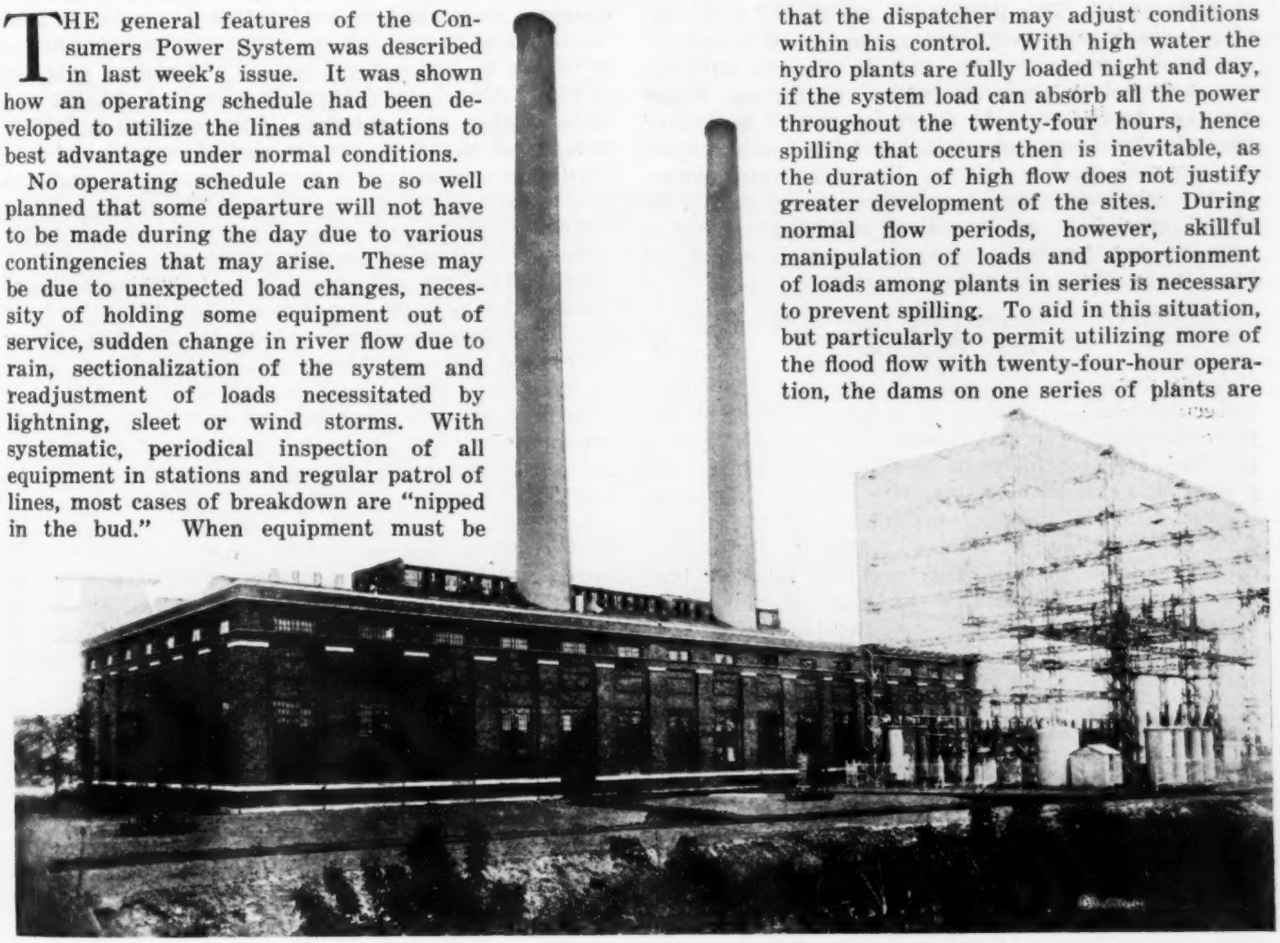
How the Consumers Power Company Prearranges Each Day's Operation, Adjusts Its Schedule for Contingencies and Anticipates Disturbances and Sectionalizing Therefor

By ALLEN M. PERRY
Western Editor ELECTRICAL WORLD

THE general features of the Consumers Power System was described in last week's issue. It was shown how an operating schedule had been developed to utilize the lines and stations to best advantage under normal conditions.

No operating schedule can be so well planned that some departure will not have to be made during the day due to various contingencies that may arise. These may be due to unexpected load changes, necessity of holding some equipment out of service, sudden change in river flow due to rain, sectionalization of the system and readjustment of loads necessitated by lightning, sleet or wind storms. With systematic, periodical inspection of all equipment in stations and regular patrol of lines, most cases of breakdown are "nipped in the bud." When equipment must be taken off for any purpose, provision therefor must be prearranged with the load dispatcher, as no operator is allowed to make any equipment unavailable for service without the dispatcher's permission. This is required to keep the dispatcher acquainted with conditions; this may be important in an emergency, to enable other work on the same or related equipment to be conducted at the same time, and to avoid interruptions of service. No service is cut off during operating hours if it can be avoided, and then only with the least inconvenience to the customers affected.

During low water the heads have to be watched particularly to avoid excessive drawdown that cannot be restored by the next morning, as only day-to-day storage is available at most of the stations. This is possible from the two-hourly operating reports, but the stations' operators are required to make special reports of excessive drawdowns or tendencies to spill water in order that the dispatcher may adjust conditions within his control. With high water the hydro plants are fully loaded night and day, if the system load can absorb all the power throughout the twenty-four hours, hence spilling that occurs then is inevitable, as the duration of high flow does not justify greater development of the sites. During normal flow periods, however, skillful manipulation of loads and apportionment of loads among plants in series is necessary to prevent spilling. To aid in this situation, but particularly to permit utilizing more of the flood flow with twenty-four-hour operation, the dams on one series of plants are being raised 4 ft., giving added storage and offsetting backing up of tailwater at plants by the ponds below.



ELM STREET STEAM GENERATING PLANT AT BATTLE CREEK

To avoid spilling water over week ends, it is necessary toward the end of the week to watch the rate of headwater elevation recovery after a draw-down in order that the total drawdown that can just be restored over the week end may be calculated. Before the load drops too much the process of drawing down the ponds is started, commencing on the upper plant in a series and progressing to the last. By similarly watching headwater recovery and drawdown with different loads, plants can be operated during the dry season with assurance that the heads can be made normal each morning.

The general trend of flow throughout the year on each of the seven rivers developed is well known to the dispatcher from hydrographs and also from the daily operating records, which show the equivalent flow in

kilowatt-hours. The equivalent flow includes water that may have been wasted and is based on the opening of spill gates and the number opened.

The effects of precipitation on stream flow are not so definitely known in specific values, nor has any definite way of calculating it been found, even though rain gages are installed at each plant and at other places on the system. In general, the Manistee River has the most uniform flow, the Au Sable being a close second, whereas the Grand and Kalamazoo rivers have a larger difference between maximum and minimum flow. Rivers situated between these two groups have intermediate characteristics. The Manistee is spring fed and, running through very level country, the run-off is delayed and spread over more time than is the case with the Grand or Kalamazoo rivers, which run through hillier country. In the northern rivers the run-off is checked immediately after a snowfall, but later becomes quite uniform with gradual melting. Hence the water powers on the southern rivers have to be prepared to take almost immediate advantage of precipitation, but a greater delay is possible on the northern rivers and the benefits are spread over a longer period.

Anticipating Disturbances and Presectionalizing Therefor

Aside from good engineering operation, inspection and maintenance, provisions for anticipating storms and presectionalizing the system constitute the chief means by which high continuity of service is maintained. On a system as extensive as this, with so many exposures, it is particularly advantageous for the dispatcher and chief operators, and in a lesser degree for the station operators, to be good weather prophets in order that preparations for confining disturbances may be made instead of only isolating and handling them after they occur.

Information on or indication of the approach of storms is first obtained from U. S. Weather Bureau reports, analysis of the "stormograph" indications, humidity readings, reports on changes of temperature, and condition of weather received periodically from each station. Comparing reception of certain high-power radio stations for audibility and reception of static have also been found to be excellent indications of approaching changes in weather conditions. Ability of company representatives along the west side of the system to see storms coming over Lake Michigan several hours in advance of their reaching the system afford later warnings, and static on the telephone lines has often warned of storms already over the system, but not visible or even apparent to any operator. Such friendly relations have been established with the general public that persons in remote regions of the system will many times call the company if something unusual occurs on the lines; farmers, train crews, etc., often render this service.

Although relay action is intended to segregate sections involving serious disturbances, the Consumers company considers it better to depend on them for unexpected disturbances and prepare by hand for possible disturbances when threatening conditions exist. With a fairly definite warning of approaching disturbances, therefore, preparations are immediately made for such shifting of loads that the system can be sectionalized. Then when positive indications are received from the station operators, sectionalization is immediately started. Where important sectionalizing stations have no regular operator, arrangements are made with some local person to do necessary switching on call for a retainer plus an hourly wage.

From past experience it has been found that storms entering the system at certain points will follow fairly definite courses and that the system can be gradually sectionalized and restored to normal as the storm passes. This is particularly true with lightning storms. Wind storms are quicker in passage, sleet storms are very indefinite in time of occurrence or duration and cyclones are almost impossible to prepare for. Sometimes general storms spread over the entire system, but the approach is gradual, so preparation is similar to that for sectional storms, but the entire system may have to be broken up into sections instead of isolating only one section. Almost simultaneously with load shifting and sectionalizing, or even before, if the warning is definite enough, all mobile forces are shifted toward and into the districts where trouble may be expected, in readiness for restoration of service if trouble occurs. These forces involve line patrolmen, construction forces and a certain percentage of the distribution crews.

Information on which to base load shifting and sectionalization is at the dispatcher's disposal in the form of the two-hourly operating reports, the dispatching board and other records previously mentioned. This information is kept so well in mind that the dispatcher faced with a situation can give the solution immediately, apparently without analysis. In fact, the dispatchers are continually in the state of preparation for emergencies.

Informed on the section receiving the storm first and knowing, from past experience, the general path it will take, the dispatcher knows what section should be isolated from the rest of the system. Whether exactly this section or a larger or smaller one is sectionalized depends on the load in that district and the power being generated there or possible of prompt generation. If the section expecting a disturbance is large, it in turn may be sectionalized.

If the sectionalizing considered necessary takes off a considerable source of supply from the rest of the system, additional hydro capacity, if available, is immediately called into use, steam units already on the line may be required to take on more load, or live-banked boilers will be called into service for bringing up fresh turbines. The ability quickly to take on load determines which units are put on first. Later, adjustments for more efficient operation may be made.

To illustrate the knowledge and thinking preceding action in such cases a specific example will be taken. No values will be cited, because they mean little, as the amount of power available at any instant is dependent upon the water, availability of apparatus, etc., at that time, and the load that has to be picked up depends on the districts segregated, the time of year, day and time of day.

Example.—A lightning storm is entering the northwestern section of the system, heading practically eastward, and eventually, if it does not die out, will travel over a band stretching from the uppermost hydro plant on the Manistee River to a point north of Grand Rapids and from the hydro plants on the Au Sable River to just north of Saginaw. At the time this storm approaches the entire system is interconnected, the stream flow is low and the steam plants at Saginaw, Battle Creek and Grand Rapids are carrying load, but the hydro group on the Manistee is carrying more load than represented by Manistee, Cadillac and contiguous territory (information available to dispatcher in the operating record). Likewise the Muskegon River group of

hydros is carrying more load than represented by the territory adjacent to its lines. From the frequency-changer meter readings at Kalamazoo and Battle Creek the dispatcher can tell how much power is being fed from the eastern to the western divisions or vice versa.

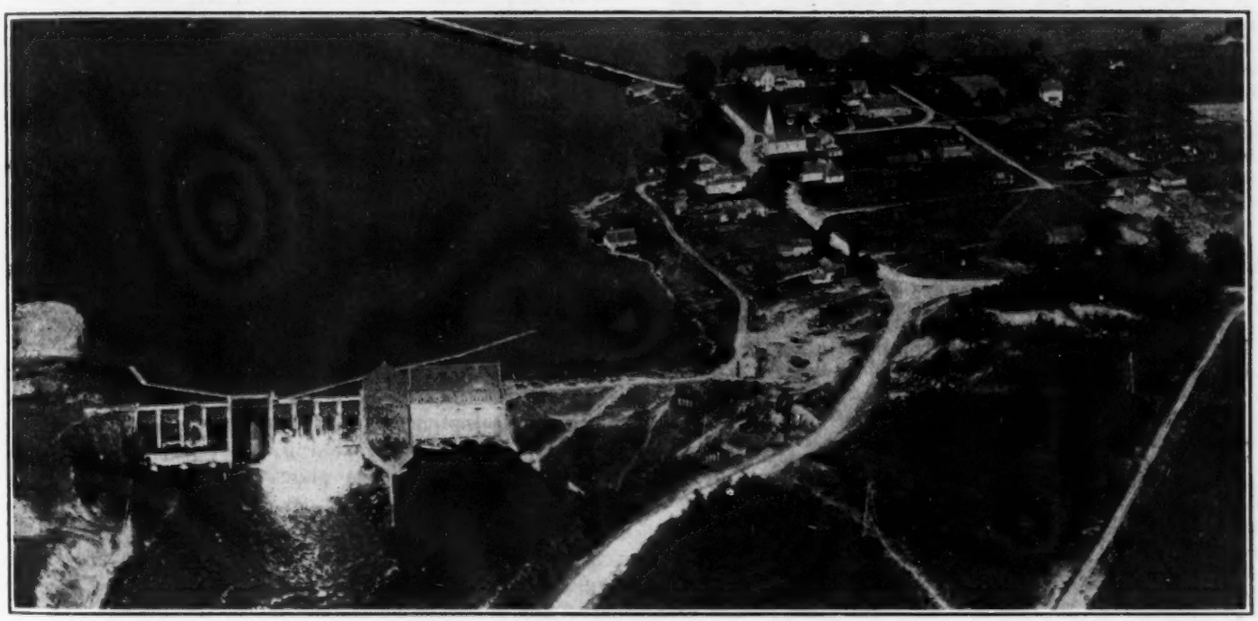
To avoid jeopardizing service on the rest of the system the procedure would be to open the line from Manistee River plants to Grand Rapids at Grand Rapids, open the line from Muskegon to Kent City at Muskegon to reduce possibilities of outage at Muskegon and facilitate quick testing, close the ordinary open tie switch at Croton paralleling all Muskegon River plants, and open the most vulnerable line from Croton to Grand Rapids. This would separate the greatest exposure and leave the remaining transmission to be cleared by relays and ready to make tests preparatory to restoration of service after a disturbance. Before this sectionalizing is done the Manistee River plants would be asked to back down on their load until they carried their district load plus the charging power for the transmission line to Grand Rapids, hydro plants on the Au Sable and other rivers not in the first part of the storm's path would be required to absorb the load as dropped, and the steam plants would be told to prepare to take over the increased hydro load and stand ready for emergency loads. Grand Rapids steam plants, being closest to the disturbance, might be given a bigger share of the load than the others. Then the sectionalizing previously mentioned would be ordered.

If the storm fringe extended over Grand Rapids, the steam stations there would be given a larger portion of the pick-up load and this section segregated from the remainder of the system by sectionalizing at Monteith near Kalamazoo.

As the storm passes eastward and reports from operators on western division indicated disappearance of the hazard, the western system would be reconnected and loads readjusted in preparation for segregating the Au Sable River plants and the transmission system in the center of the state connected with Saginaw. This would probably involve closing the normally open switch between Cooke and Five Channels stations on the Ausable River, opening the Loud-Emery Junction transmission line (both to facilitate testing), connecting the Au Sable River line with one bus of the Saginaw steam plant, putting Saginaw steam station on other bus to safeguard Saginaw and Bay City load, arranging to obtain the maximum output at Edenville and starting the steam plant at Alma to carry the central system with Edenville-Saginaw line open. Such an arrangement would probably require adding more steam generation on the southern system to back up loss of Au Sable line. If the eastern sweep of the storm spread over Saginaw, the Flint steam plant would be put on to protect the local industrial load and the eastern division separated from the rest of the system at Owosso.

By the measures previously outlined the disturbances that do occur on the Consumers system are well confined to small sections and consequently have the minimum effect on the system. However, the load dispatcher's responsibility does not end with confining the disturbances to sections; it includes isolation of the trouble and restoration of service.

In this work the dispatcher is aided by the various facilities previously mentioned, particularly specific transmission line rules covering action of all station operators immediately after an interruption of service, and by the patrolmen, construction crews, a certain percentage of the distribution department and in great emergencies by off-shift men and even office forces, and by the emergency instructions for patrolmen and linemen in cases of line trouble.



CROTON HYDRO-ELECTRIC PLANT AT NEWAGO, MICH.

Important switching stations are provided with specific rules that govern their locating and clearing trouble as well as restoring service after transmission-line trouble that interrupts or seriously interferes with the delivery of power. These instructions indicate specifically the method of testing for the circuits in trouble and the method of switching for this operation as well as to re-energize the lines and apparatus. Supplementing these specific rules are general instructions that apply to all stations. These instructions explain various ways in which transmission line trouble is manifested in the station, methods used in locating and disconnecting a faulty line and various suggestions for handling the station during the progress of the trouble.

During the first ten minutes after trouble begins, unless the operators are called or have important information to communicate, they are instructed to keep away from the telephone to avoid hindering others in the restoration of service. At the end of ten minutes, if power is not yet received, operators must make every possible effort to get in touch with the load dispatcher or chief operator, using private or leased telephone

lines, long-distance telephone, telegraph or relayed messages.

Some General Instructions. — When transmission line trouble occurs, it is either extremely severe and the indications are so unmistakable that after watching the instruments and other indications for a few seconds there is absolutely no doubt that the transmission line rules will have to be invoked by the operators in the various stations, or it is more moderate and approximately normal voltage is maintained even though there may be some indications of trouble. Under the first condition an emergency exists, transmission line oil switches in generating or other switching stations may open automatically or be opened by hand by the operator as a part of his regular procedure in locating and clearing the trouble. The line voltage will fall to zero and the machine switches must be opened quickly in the substation so as to be prepared for receiving power again.

In the second case, where the indications of distress are not so pronounced, the operators have time to obtain some idea of the kind of trouble and its characteristics by observing the magnitude and frequency of occurrence, such indications as violent fluctuations of the ammeter, voltmeter, wattmeter or other instrument pointers, excessive load not necessarily indicated, flickering of light, peculiar howling and other unusual noises in the apparatus that do not seem to be due to machinery or station trouble, tripping of machine circuit breakers, squealing and flashing of commutators, an unusual amount of static, a strong odor of ozone around high-tension apparatus, noise and static on telephone lines and instruments, continuous heavy discharging of lightning arresters and any other unusual conditions.

In general, the operators of hydro-electric and steam-generating stations are instructed by specific transmission line rules to watch all such conditions carefully and if they continue for five minutes, particularly the continuous heavy discharging of lightning arresters, to open the switch first of the transmission line on which the trouble may most reasonably be expected to be located at or before the end of this time. The other lines are then opened, if necessary, one at a time, until the trouble is cleared or until all the lines are open.

One or more attempts to energize each transmission line are made, first from the station at one end and then from the station at the other end of the line, if the first tests were not successful. These attempts are made at certain, specified times, usually stated in minutes after the line voltage falls to zero, and the times are carefully chosen so the tests will not interfere with one another. Single lines or distribution circuits are commonly energized just as soon as power is available to do so. Station switches that sectionalize a through transmission line are not allowed to be operated except upon specific orders from the load dispatcher or chief operator, unless there is a failure on one of the lines that is so close that the operator can see it himself or unless the operator can be absolutely sure of the accuracy of a report received from outside sources. In this case only, if the operator cannot establish telephonic communication with the load dispatcher or chief operator or operator of the station at either end of the transmission line, he is allowed to open the switch in the line toward the trouble at his first opportunity when the line voltage is zero. This will allow power to be fed to the stations from the good end of the line if an attempt is made to energize it.

If the station switching involves a line that is fed from only one end, but serves more than the station considers, the sectionalizing switches are not allowed to be opened except upon specific orders of the load dispatcher or chief operator, except when trouble is definitely known to be on the line beyond the station and communication cannot be established.

If the station is supplied from a line or circuit treated as a distribution circuit, specific rules and instructions usually apply, but if not, the switching from one feeder to another is done only upon orders from the load dispatcher or chief operator. To protect life or property, the operator is authorized to open without orders any switch or switches that will kill that particular line or apparatus, but an immediate report of the action must be made to the load dispatcher or chief operator.

Various switching combinations are employed in the normal operation of the station, which if not changed when power fails will result in damage to the apparatus in the station or on the customer's premises, if power is suddenly applied to the station. Specific instructions are given each operator for opening these switches or clearing the station. These switches involve rotary converters, motor-generators, distribution circuits, meter voltage regulators and generating units.

While waiting for the restoration of transmission line service, the operators are instructed to make a close inspection of all apparatus to ascertain whether it is fit for service and to be on the alert for telephone calls. As soon as possible after clearing station trouble of transmission line trouble the operator must communicate with the load dispatcher or chief operator and report any interruption of service and damage to equipment, service that cannot be restored and any unusual conditions under which the station may be operating at the time.

MOBILIZING RESTORATION CREWS

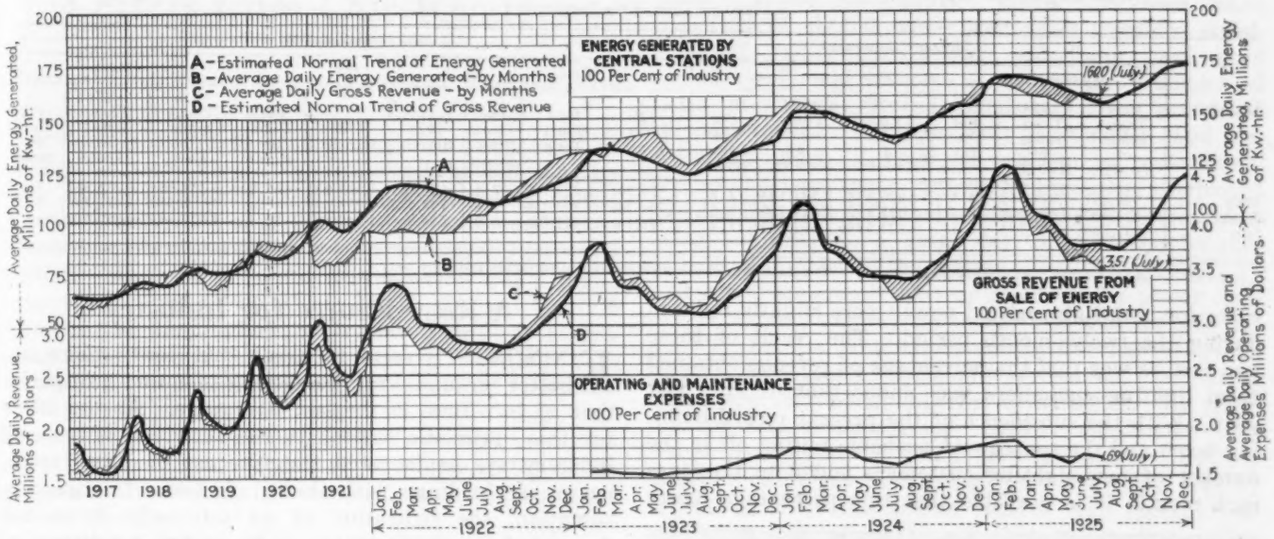
As mentioned, when considering preparations for disturbances, the mobile forces are gradually shifted toward any possible seat of trouble. By having at least one line patrolman working out of seventeen well-distributed switching stations on the system and two from Grand Rapids, Battle Creek and Saginaw, the dispatcher can be quickly advised of the sources of trouble so restoration crews can be dispatched thereto. Patrolmen not on duty keep the chief operators in their division so well posted on their whereabouts that frequent tests have shown they can be located in from one to two minutes on the average. Patrolmen on the line call in periodically over private or leased lines, so they are readily available. When severe disturbances occur they can generally be detected by a patrolman who may be out along the line by the noise set up by the line. Loss of voltage can be detected by cessation of the corona hum. In such cases the patrolmen call the chief operator for instructions, as they would also do in case they saw a storm approaching. If communication between the Au Sable River plants and the chief operator were lost, the operator at Cooke is required to co-ordinate operations on this portion of the system. A similar arrangement with operators on the other rivers is also in effect. Among the emergency instructions governing patrolmen and linemen in case of line trouble are:

In case of any storm or trouble, communication must be established with the load dispatcher directly or by relay. Preparation for taking care of any case of line trouble must be made without awaiting orders from the load dispatcher, and these preparations include having necessary equipment available, seeing that it is in condition for use and providing means of transportation. The kind of equipment that shall be carried depends on whether the patrolman can ride or has to walk, but is specified for each instance. When searching for trouble, the patrolmen are required to communicate with the load dispatcher periodically. Even during an emergency the men are not allowed to touch lines until the switches have been tagged and the line grounded. When the trouble is located, the patrolman is required to give an accurate description of the damage, with his suggestions for repairing the trouble, first doing such work as he can unaided. The chief requirement emphasized is clearing the trouble as quickly as possible, if necessary leaving permanent repairs until later.

Some of the methods of repairing damage done by sleet, lightning, wind and rain storms and restoring service promptly are interesting in themselves, but cannot be related in this discussion of the load dispatcher's duties, even though the dispatching of men and materials for such repairs is an important part of his duties.

C. W. Tippy is vice-president and general manager of the Consumers Power Company, W. W. Tefft is vice-president and chief engineer, B. E. Morrow is manager of production, transmission and construction, and J. G. Hemstreet is superintendent of operation.

July Energy Requirements 16.4 per Cent Over Last Year


A – Estimated Normal Trend of Energy Generated
B – Average Daily Energy Generated – by Months
C – Average Daily Gross Revenue – by Months
D – Estimated Normal Trend of Gross Revenue
ENERGY GENERATED BY CENTRAL STATIONS
100 Per Cent of Industry
GROSS REVENUE FROM SALE OF ENERGY
100 Per Cent of Industry
OPERATING AND MAINTENANCE EXPENSES
100 Per Cent of Industry
1600 (July)
351 (July)
659 (July)
Average Daily Energy Generated, Millions of Kw.-hr.
Average Daily Revenue, Millions of Dollars
Average Daily Energy Generated, Millions of Kw.-hr.
Average Daily Revenue and Average Daily Operating Expenses Millions of Dollars
1917 1918 1919 1920 1921
1922 1923 1924 1925

CENTRAL-STATION operations during the month of July were 16.4 per cent over July of last year. This percentage gain is the largest recorded during the year. In January the operations were only 6.8 per cent over those in 1924, but this percentage gain increased month by month, reaching the high point in July. The July output of 4,958,293,000 kw.-hr. was 3.2 per cent above the estimated normal for that month, this normal being based on the operations of the past five years.

The gross revenue from the sale of energy during July was $108,800,000, which was 6.9 per cent under the estimated normal for the month. The July revenue was, however, 14.1 per cent above that of July last year. For the first time data are given on the distribution of the gross revenue as between lighting, power, railways and sales to other utilities. This distribution is based upon the best information obtainable and is believed to picture quite accurately the distribution of the central-station monthly revenue. A very significant fact is brought out in these detail revenue figures. The revenue from lighting customers during July is estimated at $71,300,000, or 65.5 per cent of the total revenue. In July, 1924, the revenue from lighting customers was $64,200,000, or 67.4 per cent of the total revenue. This proportionate loss in the revenue from lighting customers and proportionate gain in the revenue from power customers is the result of two factors—reduced rates and energy consumption. The amount of energy consumed by power customers during July of this year was 500,000,000 kw.-hr. greater than in July of last year, while the residential consumption was about 60,000,000 kw.-hr. over last year. This material gain in the consumption of energy for power purposes resulted in a large increase in the revenue obtained from that class of customers. The

TABLE I—GENERATION AND DISTRIBUTION OF CENTRAL-STATION ENERGY IN THE UNITED STATES
(100 per Cent of the Industry)

Month	Kw.-Hr. Generated Monthly *			Distribution of Energy Generated										Energy Purchased by Public Utilities for Resale Kw.-Hr.	
				Total Energy Consumption by Central-Station Customers, Kw.-Hr.		Energy Consumed for Lighting, Kw.-Hr.		Energy Consumed for Power, Kw.-Hr.		Energy Sold to Electric Railways, Kw.-Hr.		Energy Used in Intracompany Business Including Line Losses, Kw.-Hr.			
	1925 Thousands	1924 Thousands	Per Cent Inc.	1925 Thousands	1924 Thousands	1925 Thousands	1924 Thousands	1925 Thousands	1924 Thousands	1925 Thousands	1924 Thousands	1925 Thousands	1924 Thousands	1925 Thousands	1924 Thousands
May.....	4,812,665	4,413,107	9.0	3,883,665	3,563,107	1,089,000	1,032,000	2,255,665	1,999,107	539,000	532,000	929,000	850,000	768,000	676,000
June.....	4,828,757	4,194,991	15.2	3,892,757	3,385,991	1,067,000	1,022,000	2,303,757	1,849,991	522,000	514,000	933,000	809,000	726,000	651,000
July.....	4,958,293	4,253,869	16.4	4,002,293	3,432,869	1,089,000	1,032,000	2,370,793	1,860,869	542,500	540,000	956,000	821,000	774,000	662,000

* Data on "energy generated" are those collected and published by the United States Geological Survey for all public utilities minus such data as are collected on energy generated by electric railway companies, reclamation service and manufacturing plants. The data are, therefore, for the electric light and power industry only.

TABLE II—CENTRAL-STATION FINANCIAL OPERATIONS FOR THREE MONTHS IN THE UNITED STATES
(100 per Cent of the Industry)

Month	Total Gross Revenue from Sale of Energy†			Estimated Distribution of Gross Revenue								Total Operating and Maintenance Expenses‡	
				Lighting Customers		Power Customers		Electric Railways		Other Public Utilities			
	1925 Thousands	1924 Thousands	Per Cent Inc.	1925 Thousands	1924 Thousands	1925 Thousands	1924 Thousands	1925 Thousands	1924 Thousands	1925 Thousands	1924 Thousands	1925 Thousands	1924 Thousands
May.....	$111,576	$101,200	10.2	$74,052	$67,040	$27,068	$24,450	$4,312	$4,250	$6,144	$5,930	$51,300	$47,800
June.....	110,017	100,300	9.7	72,503	67,750	27,530	23,030	4,176	4,210	5,808	5,310	51,300	47,500
July.....	108,800	95,300	14.1	71,300	64,200	27,320	21,800	4,250	4,150	5,930	5,150	52,500	47,800

† Aggregate gross revenue from actual consumers, and sales to other public utilities for resale, involving a certain amount of duplication.
‡ Do not include interest, taxes, depreciation or sinking fund.

TABLE III—OPERATIONS OF CENTRAL-STATION HYDRO AND FUEL POWER PLANTS IN THE UNITED STATES||
(100 per Cent of the Industry)

Month	Energy Generated						Fuel Consumption								
	Hydro Plants			Fuel Power Plants			Coal			Oil			Gas		
	1925 Thousands of Kw.-Hr.	1924 Thousands of Kw.-Hr.	Per Cent Increase	1925 Thousands of Kw.-Hr.	1924 Thousands of Kw.-Hr.	Per Cent Increase	1925 Short Tons	1924 Short Tons	Per Cent Increase	1925 Barrels	1924 Barrels	Per Cent Increase	1925 Thousands of Cubic Feet	1924 Thousands of Cubic Feet	Per Cent Increase
May.....	1,992,231	1,911,563	4.3	2,820,434	2,501,544	12.8	2,579,798	2,409,707	7.1	639,763	1,163,023	—45.0	3,434,604	2,908,367	18.0
June.....	1,811,300	1,670,862	8.4	3,017,457	2,524,129	19.4	2,704,348	2,307,156	17.2	754,642	1,299,497	—41.8	3,666,562	4,176,731	—12.2
July.....	1,832,709	1,591,595	15.1	3,125,584	2,662,274	17.3	2,776,141	2,392,726	16.0	814,666	1,349,838	—39.7	4,021,164	4,926,990	—18.5

|| As collected by United States Geological Survey. The data are for the electric light and power industry only.

rates for both lighting and power were slightly reduced during the twelve-month period. The result of these two factors was that the percentage of revenue obtained from lighting customers was under that of July last year. With the subsidence of the present record building boom and the consequent probable falling off in the number of new lighting customers added to the lines each month, it is probable that this percentage figure will be reduced still further, unless the consumption of energy by lighting customers is materially increased.

TABLE IV—OPERATING RATIO OF CENTRAL-STATION COMPANIES

Month	Operating Ratio					
	Steam Plants		Hydro Plants		Combined Steam and Hydro Plants	
	1925	1924	1925	1924	1925	1924
May.....	49.1	50.4	23.7	32.8	44.2	46.9
June.....	52.1	52.1	28.8	25.4	43.4	46.0
July.....	52.7	53.4	26.8	27.8	54.1	50.8

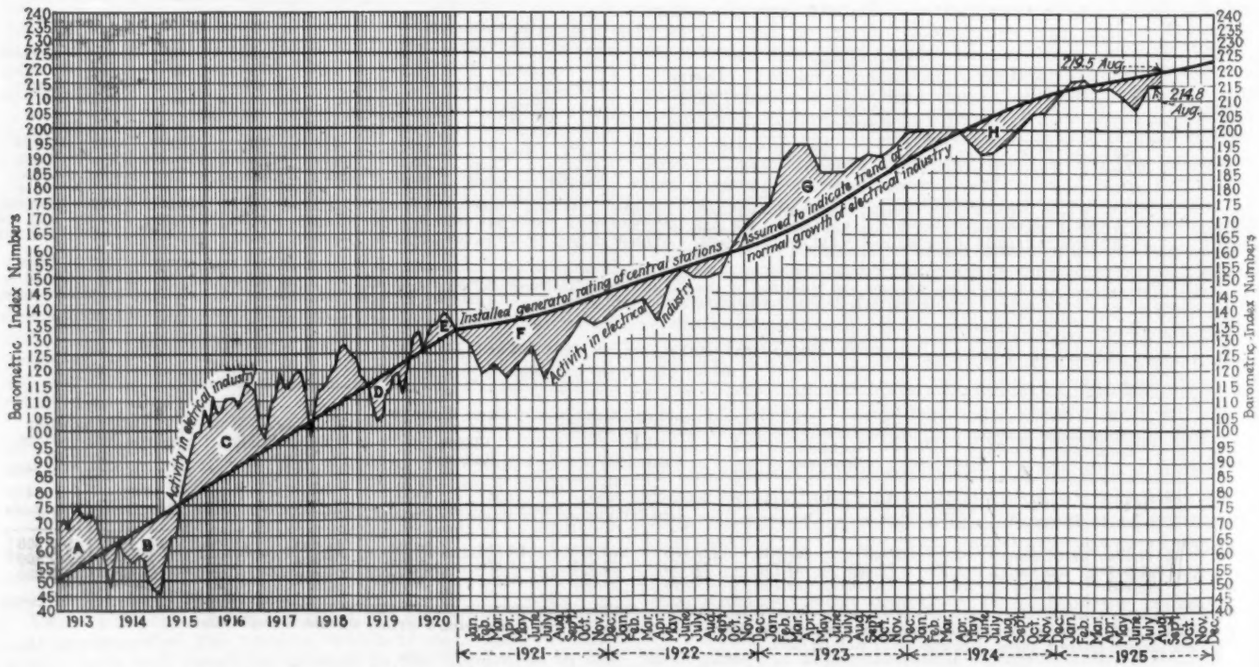
It must be remembered in studying these detail figures on revenue that there is no direct relation between the kilowatt-hours consumed each month and the gross revenue as reported by the industry. There is always a certain amount of lag between the actual consumption of energy and the payment for that energy. Energy purchased in January is not paid for until some time in February or even at a later period, since bills are not rendered until the end of the month.

A Rosy Future for Industry

ECONOMISTS seem to agree that today there are better grounds for predicting genuine prosperity than at any time in the last five years. As the bases for this optimistic outlook in the activities of general industry are enumerated the forecast of large crops, heavy car loadings with their reflection of large consumption, the indication of an unusually large fall demand for manufactured goods, record building construction and good export trade.

There is every reason to expect that this optimism will extend to the operations of the electrical industry taken as a whole. Production figures upon which the "ELECTRICAL WORLD Barometer of Business Conditions in the Electrical Industry" is based indicate that July and August witnessed a decided upward trend in the activities of the industry. It is true that this upward trend was slightly interrupted in August, but all basic factors indicate that this interruption was only temporary.

During August the electrical industry as a whole was operating at 4.7 per cent below the estimated normal for the month. In July it was operating at 4.5 per cent (revised) and in June at 6.3 per cent below normal. Incomplete returns indicate that the electric light and power branch of the industry continued the upward swing which started in June and was operating at approximately 3.0 per cent above the estimated normal during August.



"ELECTRICAL WORLD" BAROMETER OF BUSINESS CONDITIONS IN THE ELECTRICAL INDUSTRY

Letters from Our Readers

Power Factor Needs Improvement in England Also

To the Editor of the ELECTRICAL WORLD:

It is interesting to read a letter in your issue of August 15 from Val A. Fynn in which he mentions his long study in search of a high-power-factor motor. I recall a conversation of his some eighteen or nineteen years ago, remembering how keen he was then on this subject. At the time mentioned the writer was a young man going through the shops of the General Electric Company at Birmingham, where Mr. Fynn was having some experimental alternating-current machines constructed. I believe these machines were of the alternating shunt commutator type. Mr. Fynn might possibly remember that there was a fair amount of trouble with the brush gear (I do not, of course, refer to his designs), it being my job to take the machines apart several times.

Judging by the amount of attention given to the question of low power factor in the ELECTRICAL WORLD, it would appear that plant engineers in America are more alive to this subject than the majority of plant men in this country. I have always agreed with the view expressed in the article of P. C. Jones, which appears on the same page as Mr. Fynn's letter, viz., that ordinary induction motors should be worked high up on the load curve, assuming, of course, that a good general compromise is made.

In this connection I have in mind a certain large industrial plant working with a great number of three-phase induction motors where the conditions for almost constant load are very favorable. In this plant most of the machines are only lightly loaded. The plant engineer, on being questioned about the great number of unnecessary machines, made the statement that it made the power factor high—in many cases over 100 per cent.

It is no exaggeration, I think, to say that the statement given above would represent the type of "knowledge" which a fair proportion of responsible plant men in this country possess—a fact to be regretted.

Birmingham, England. H. L. CAPE.

Power Companies and the Merchandising of Radio Equipment

To the Editor of the ELECTRICAL WORLD:

In a recent issue of the ELECTRICAL WORLD I noted an editorial which recommended that operating companies engage in the merchandising of radio sets. It seems to me that operating companies should approach this activity rather slowly. Several months ago (May 23, page 1080) you printed a letter from S. Kruse, who is technical editor for *QST*, in which Mr. Kruse indicated very decided dissatisfaction with the attitude of the electrical utilities toward the problems of radio interference. Now, Mr. Kruse represents the more intelligent type of radio enthusiast; so it is very reasonable to assume that the attitude of the average owner of a radio receiving set will be less reasonable than Mr. Kruse's attitude.

In spite of all that has been done and written on the subject of radio interference, the fact remains that the only consistent and continuous study of radio interference has been that carried on under the auspices of the inductive co-ordination committee of the National Electric Light Association. There have been many criticisms of electric power companies from the standpoint of radio interference, and there have been sporadic attempts to solve a few of the problems of radio interference by individuals and small groups at various times. But the only systematic and co-ordinated effort to solve the problem of radio interference has been that put forth by the power companies and one large manufacturing company, while they were being subjected to a great deal of criticism because of lack of interest in the matter.

It would apparently be very desirable for power companies to investigate the increasing number of "A" and "B" battery eliminators and to merchandise them, because, apparently, there are several on the market which are very much superior to batteries. By pushing the sale of satisfactory battery eliminators they would benefit both the public and themselves. But the desirability of merchandising radio receiving sets by operating companies should receive very careful consideration. It seems to me that no electric utility should undertake to merchandise radio receiving sets until it is in a better position to handle radio interference complaints than most operating companies are at the present time.

A. M. WILSON,
Professor of Electrical Engineering.
University of Cincinnati,
Cincinnati, Ohio.

Hydro-Electric Development in Finland

A DESCRIPTION of the work of the government of Finland in developing the water power of the Vuoksi River and the construction of a country-wide 120,000-volt transmission system is given by Hugo Malmi in the August issue of *World Power*.

About 600,000 hp. of hydro-electric power is available on the Vuoksi River, which flows from Lake Saimaa into Lake Ladoga, with a total catchment area of 23,000 square miles. The surface area of Lake Saimaa is 2,000 square miles and the normal medium river flow is 20,100 cu.ft. per second. In the first 15 miles below the lake there are rapids with a total head of 211 ft. which can be utilized at four power sites. Work was started at the Imatra site in 1922 on construction of a regulating dam which will give a 75-ft. head. The initial installation will consist of three 29,000-hp. Francis type waterwheels directly connected to three 24,000-kva. (80 per cent power factor), 10,000/11,000-volt generators. The generators are directly connected to transformers without intermediate switches or busbars. Space is provided for a fourth unit of a similar type.

Energy from Imatra will be transmitted at 120,000 volts over an iron-framework tower line with tower spacings varying from 650 ft. to 1,000 ft. Most of the lines will eventually carry two conductors, though only one will be placed at first. The total length of the transmission system will be 354 miles, and the greatest distance from the power station will be 136 miles. The cities of Helsingfors, Viborg, Karis and Hikiä are among those served by the system.

The initial development at Imatra will cost about $9,000,000, of which half will be for the transmission system. The power developed can be raised from 75,000 hp. to 160,000 hp. at comparatively small cost, and after further regulation of Lake Saimaa the Imatra site will produce 216,000 hp.

Central Station and Industrial Practice

Relay Maintenance Practice

By W. D. WILKINSON
Superintendent Meters and Tests, Utica Gas & Electric Company

THERE is one and only one way of starting a relay system, and that is to make a short-circuit study of the entire system and its interconnections. No company would undertake to rebuild its distribution lines without first determining the requirements by making a voltage and load survey, and on this same basis you cannot expect relays to function properly under short-circuit conditions unless you know what these conditions are going to be.

In most companies, this work will fall into the hands of an engineer connected with the engineering department. In the Utica Gas & Electric Company, because of previous experience, the task fell to the writer. The calculations are not difficult, but are extremely tedious and can be expedited by the use of a short-circuit calculating table.

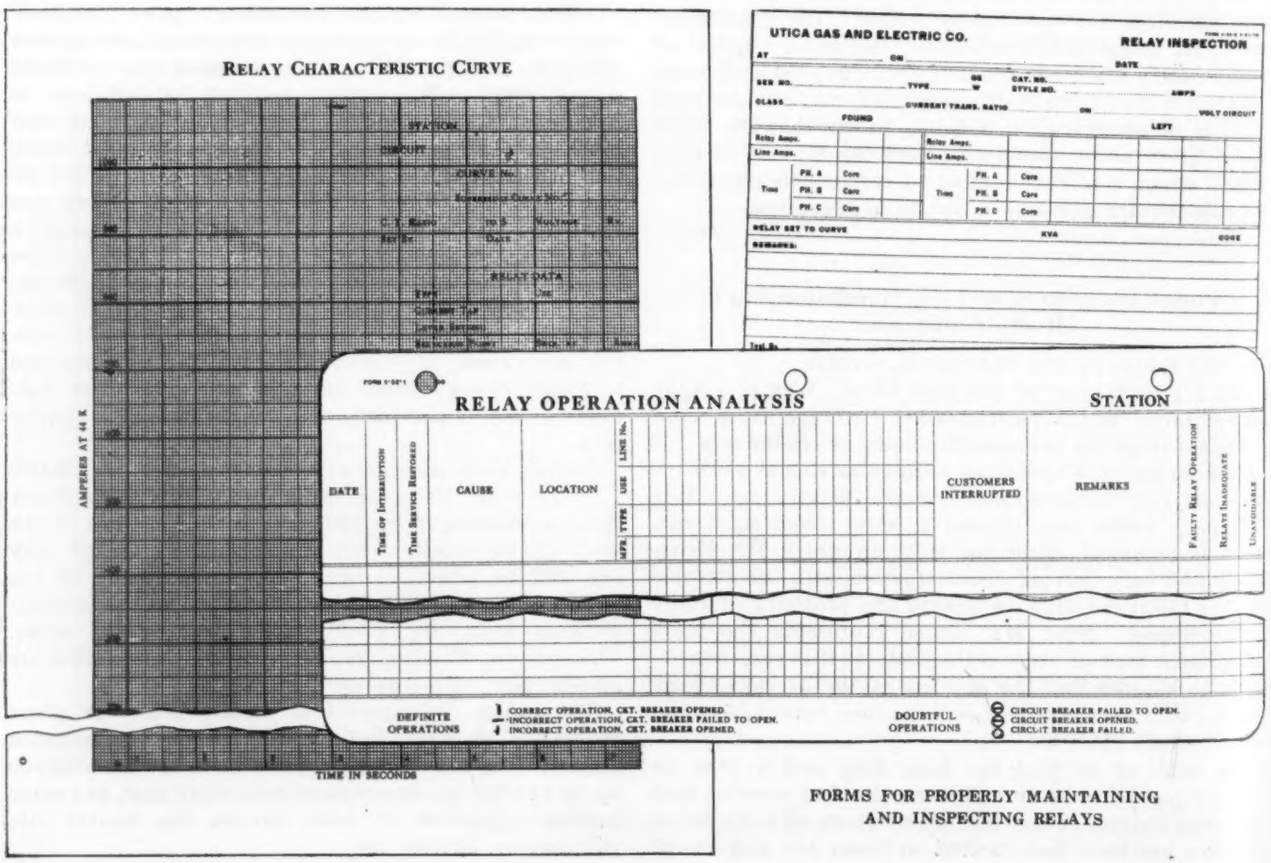
When the short-circuit conditions are known, the engineer in charge can give the relay inspector the current values and the time settings to which each relay should be set. A relay should receive the same consideration by the relay man as does the watt-hour meter by the meterman, and they should be set with as great accuracy as is possible.

A good loading device, ammeter and cycle counter or timer are the essentials of a relay inspector's equipment. A stop watch should not be considered a timing device. We have used a water rheostat as a loading device that has been quite satisfactory, but at the present time we are working on a resistance type that we hope will be more satisfactory and less cumbersome to handle.

Setting any type of relay by the manufacturer's curve or data on the name plate of a relay is very unsatisfactory except for the roughest kind of a setting. The manufacturer does not know the conditions under which you are going to use the relay, and these conditions are as variable as the weather. The data on the name plate are there simply to act as a guide to give you an idea of what can be expected under certain definite conditions.

Also, the characteristic curves supplied by the manufacturer on bushing type current transformers are inadequate. You do not use a manufacturer's characteristic curve when correcting a watt-hour meter for ratio errors and you should not use the characteristic curve on a bushing type current transformer for a relay setting. The shape of the curve varies decidedly with the length and resistance of the secondary leads and the number of relays connected. The only correct way is to run a ratio curve on the bushing type transformer and obtain the curve under the conditions under which the transformer is to operate.

Enough current and time readings should be taken on every relay so that a curve can be plotted showing its characteristics under the con-



FORMS FOR PROPERLY MAINTAINING AND INSPECTING RELAYS

RELAY OPERATION REPORT FOR 1924 OF UTICA GAS & ELECTRIC COMPANY

Analysis of Operations on 22-kv., 44-kv., 66-kv. Transmission Lines

		Per Cent
Total relay operations	44	
Correct operations	35	79.55
Incorrect operations	7	15.9
Doubtful operations	2	4.55

Analysis of Incorrect Operations

Relays inadequate	2
Relays set too light	1
Breaker opened on trouble on another part of system	1
Faulty relay	2
Relays did not operate	1

Analysis of Doubtful Operations

Inghams Mills on and high-tension switch at Little Falls not non-automatic	1
Cause unknown	1

Summary of All Relay Operations

		Per Cent
Total relay operations	198	
Correct operations	175	88.4
Incorrect operations	15	7.57
Doubtful operations	8	4.03

Analysis of Incorrect Operations

Breaker opened on trouble on another part of system	1
Relays set too light	4
Faulty relay	2
Relays did not operate	1
Trip mechanism failed	2
Relays set too heavy	1
Relays inadequate	2
Relays connected wrong	1
Contacts on relay vibrating	1

Analysis of Doubtful Operations

Blown fuse on potential relays	1
Cause for switch operating unknown	6
Inghams Mills on and high-tension switch at Little Falls not non-automatic	1

Comparison of 1923 and 1924

	1923	Per Cent	1924	Per Cent
Total relay operations	120	.....	198	.....
Correct relay operation	96	80	175	88.4
Incorrect relay operation	9	7½	15	7.57
Doubtful relay operation	15	12½	8	4.03

ditions that the engineer in charge has specified. For this work an inspection card and curve sheet (shown herewith) are used. The inspector fills out the card and the curve is plotted from this card in the office. It will be noted that all curves are plotted on a common voltage. This is essential in order to determine the time selection between relays operating at different voltages.

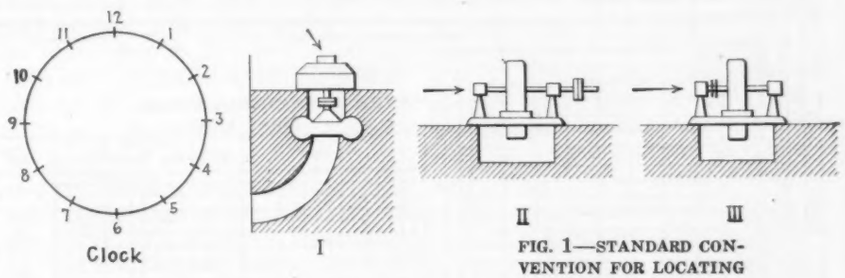
After the relays are set, they should be inspected periodically. We have found that a three months schedule works out very satisfactorily.

Any system devised will be a failure unless the operating department cooperates to the fullest extent. When a fault occurs and the relays function to isolate the defective line or piece of equipment, unless the operating department gets all the information as to what happens—that is, what switch or switches are opened, etc.—and also notes what the conditions were, the relay man cannot analyze the operation and determine whether or not the relays functioned correctly. We have worked it out in our own system so that the relay inspector is notified immediately of every automatic switch operation by the chief load dispatcher. This notification at a later date is confirmed in writing, carrying with the above information, the system set-up—that is, the capacity connected and a complete history of all operations. The relay inspector, after analyzing the trouble, notes the results on an analysis sheet, a separate analyzing sheet being carried for each station.

Up to within a year ago, every faulty relay operation was analyzed by a short-circuit calculation. This served two purposes: first, as a check on the relay operation, and second, as a check on the duty of the oil circuit breaker. To facilitate this work, we have completed a short-circuit calculating table. If the calculation shows an incorrect setting, we analyze the situation and make the necessary correction. At the end of the year, the results of the analysis sheets from all stations are tabulated and a résumé made.

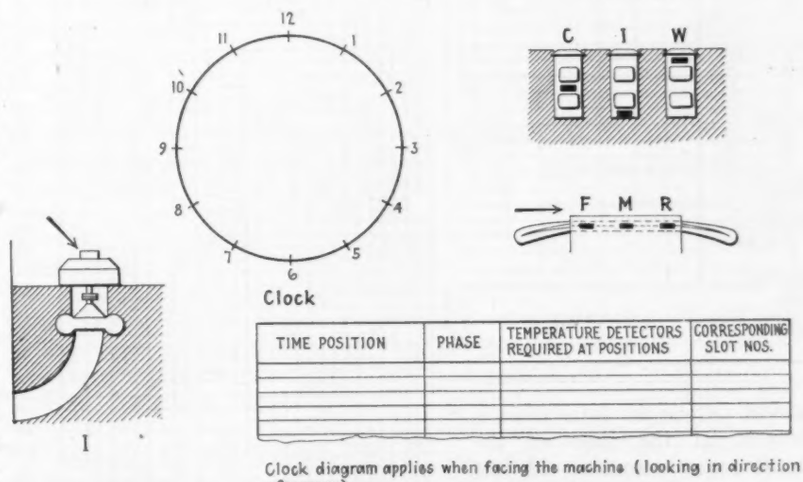
Diagrams for Locating Machine Attachments

WHEN making specifications for manufacturers of machinery, it is very convenient to use a graphic form for indicating the location for parts of the machines or for attachments. The location of stairways, ventilating duct outlets and inlets, thermocouples and other machine features can be made definitely by use of a graphic chart. The accompanying standard conventional location charts have been developed and used successfully by the engineers of the Hydro-Electric Power Commission of Ontario. Fig. 1 is used for locating general features of generators and Fig. 2 is another form to be used for the same purpose and in addition enables the engineers to specify the exact location of thermocouples.



The clock diagram applies when facing the machine, (looking in the direction of the arrow)

FIG. 1—STANDARD CONVENTION FOR LOCATING FEATURES OF ALTERNATING-CURRENT MACHINES



TIME POSITION	PHASE	TEMPERATURE DETECTORS REQUIRED AT POSITIONS	CORRESPONDING SLOT NOS.

Clock diagram applies when facing the machine (looking in direction of arrow)
Slots shall number clockwise around frame from 12 o'clock.
In no case shall hot thermocouple joint be located opposite an air duct in the laminations

C- Indicates thermocouple located between coils
I- " " " at bottom of slot next iron
W- " " " below wedge
F- " " " near front of slot
M- " " " " middle of slot
R- " " " " rear of slot

FIG. 2—CLOCK DIAGRAM FOR LOCATION OF IMBEDDED TEMPERATURE DETECTORS IN ALTERNATING-CURRENT MACHINES

Semi-Graphic Record of Meter Tests

BY STANLEY GREEN
Merchants Heat & Light Company, Indianapolis

A SYSTEM of tabulating meter test data monthly is used by the Merchants Heat & Light Company, Indianapolis, which embodies in one form of convenient size the work sheet and permanent record which has semi-graphical characteristics. Its chief advantage lies in its workability and the fact that the scheme sold itself to the operators. Different colors are used for fast and slow and the code letters in each zone greatly facilitate the work of the tabulator. Since the tabulation is performed at the time of the work, it saves resorting of test cards, as would be necessary if tabulations were performed later.

One sheet (Fig. 1) is used for each make, type and testing period of meters. The sheets are classified and filed in a standard post binder kept at the local property. The testing periods called for on the sheets are those specified by the public service commission. As indicated on the test sheet, the tests are classified horizontally, first generally as to light load and full load tests and then as to whether they are periodic, stock, installation, office - complaint or customer-complaint tests, and vertically for percentage error. Furthermore, the month the test was made is indicated by the symbol placed in each square, the months being numbered 1, 2, 3, etc., up to 9 and the remaining months as *o*, *n* and *d* respectively. The boxes in each zone permit indicating the number of tests made, while the total number of each kind of test are recapitulated at the bottom of each column. Provision is also made for indicating the number of meters in which jewels were changed, repair tests were made or new meter tests were conducted.

The group accuracy in per cent may be calculated from the following formula:

$$(1/2(a-a') + 3/2(b-b') + 3(c-c') + 7(d-d') + 15(e-e') + 25(f-f') + 15(g-g') - 100h')$$

in which the letters indicate the number of meters in each zone of accuracy.

From the form shown in Fig. 1 a recapitulation of meter test tabulation (Fig. 2) is made out in triplicate each month and copies are distributed to the superintendent of the meter division, local manager and local meter superintendent. The class of test is indicated by a letter symbol, *P*, meaning periodic; *S*, stock;

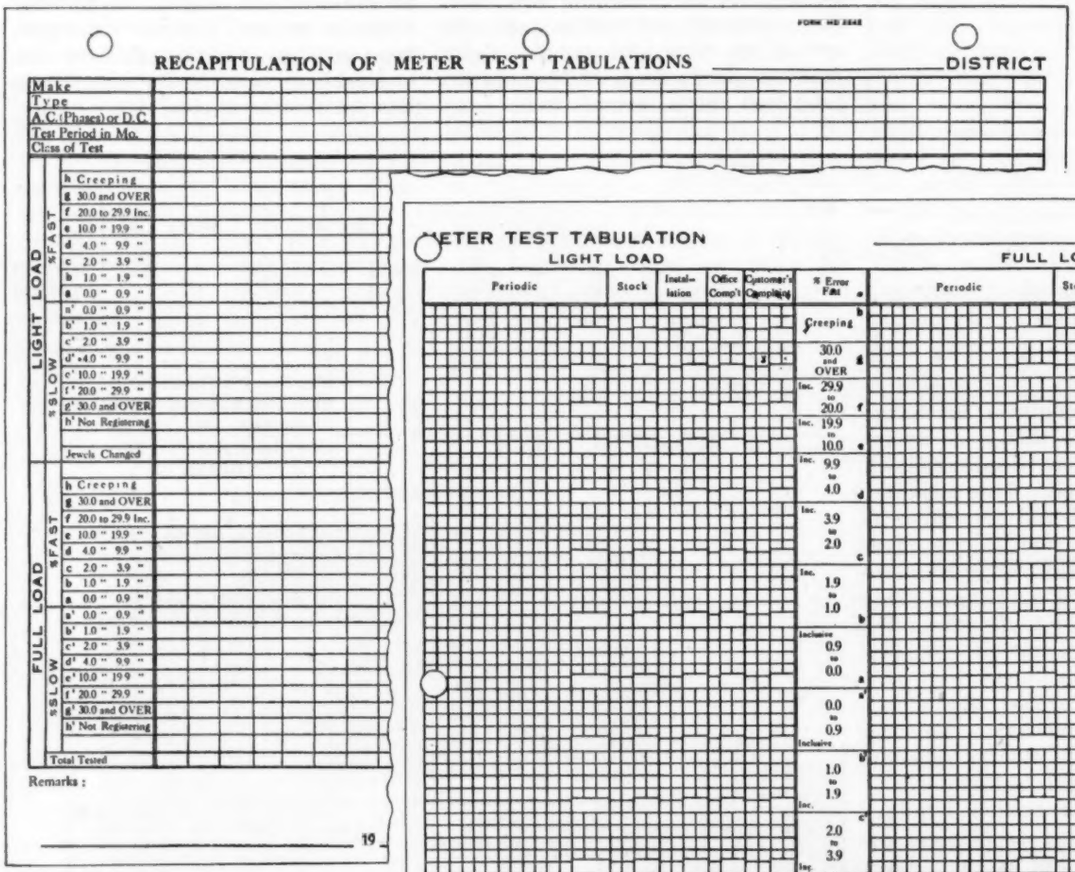


FIG. 2—RECAPITULATION FORM FOR METER TESTS

FIG. 1—SEMI-GRAPHICAL METER TEST TABULATION

I, installation; *O*, office; *C*, customers' equipment; *N*, new meter test, and *R*, repair test.

The form shown in Fig. 1 indicates at a glance the relative accuracies of all meters tested, the group accuracy, the total number tested, the month tested, the number of jewel changes, repair tests, etc., all for the same class of instrument.

Transformer Cooled by Air Jets

Particularly Adapted to Transformers Used Over Wide Variation Where Water Is Unsuitable or Unavailable—May Be Erected Indoors or Outdoors

BY L. H. BURNHAM
Transformer Engineering Department, General Electric Company, Pittsfield, Mass.

COOLING, always a difficult problem in large transformers, has been solved by a new combination in the three 10,000-kva., single-phase units recently installed by the Illinois Electric Power Company of East Springfield, Ill. The transformers are rated 60 cycle, 10,000 kva., 140,000/37,500 volts. In these oil-insulated transformers the oil is cooled by accelerating the natural convection currents with small air jets applied to the radiating surface of the tank. These units, the first of their kind, passed all tests successfully and met all guarantees.

Generally, oil-insulated transformers are cooled either by circulation of water through cooling coils immersed in the oil (water-cooled), or by the use of so large a radiating surface that the natural circulation of air along this surface is sufficient for cooling the oil (self-cooled). In some cases, combination self and water-cooled transformers are used, and operate as self-cooled units on partial load, and as doubly cooled units, both self and water-cooled, at maximum load. Also, these transformers were designed to operate at moderate loads as self-cooled units and, at their maximum rating, supplemented by air jet cooling.

Many years ago experiments were made to determine the effect of a blast of air on the tank surface of transformers and the supplementary radiators. Much reduction in necessary surface was found. However, a large volume of air at very low pressure was necessary, as a 10,000-kw. unit required about 20,000 cu.ft. of air per minute. Such volumes of air at only a fraction of an ounce pressure require inefficient blowers, and expensive air-distributing ducts.

Later experiments showed that many small air jets would serve to augment natural convection currents, as well as to break up the air film normally adhering to the radiating surface, and that therefore it was necessary to deliver but a small part of the volume of air to take care of the losses. If a small volume of air, at sufficient velocity to disturb the air film, was supplied, the cooling air required would flow in from outside. These transformers were designed and built using this principle.

The type of coils, winding, core, insulation, bracing, etc., is identical with the present standard practice in both self and water-cooled units. In other words, standard construction, with exception of the method of cooling, is furnished throughout.

These particular transformers have several ratings. They will carry 4,500 kva. as self-cooled units with ambient air at 40 deg. C. With air jet cooling, they will operate at 10,000 kva., their normal rating, without exceeding 55 deg. C. rise above the ambient air at 40 deg. C.

The tank is built with a false bottom, which forms a chamber in the base, the air being supplied through an oval intake. From this air chamber the air passes through the pipes to the external surface of the cooling radiators and impinges in small jets on opposite sides of the radiators at an angle of about 45 deg. These air jets meet and flow along the radiating surface to the top of the radiator, drawing in additional air currents of far larger volume, which together cool the oil in the transformer. A comparatively small volume of air at a fairly high pressure (2 or 4 oz.) is supplied to all transformers by a blower and a motor controlled either automatically or by hand. The power required is only about 5 per cent of transformer losses.

When the blower is controlled automatically, there are two thermostats located in the top oil of each transformer—one thermostat to start the blower, and the other to stop the blower when certain temperatures are reached. All these starting thermostats in the tank are connected in parallel, as are all those used for stopping. They control a magnetic switch, which operates a standard automatic compensator.

Estimates indicate that the cost of this type of transformer lies about midway between the standard water-cooled and the standard self-cooled designs. This cost includes the cost of blower equipment designed for either indoor or outdoor service. The cost saving for this type increases with the increase in capacity. Excluding blower load and motor losses, the efficiencies will be the same as a water-cooled transformer of like rating. Losses due to the addition of blower and equipment will reduce the efficiency of the unit only about 0.05 per cent. Suitable applications for this type of transformer are:

1. For installation where water is not available, unsuitable for use, or expensive.
2. It may be advantageously used in place of a straight self-cooled transformer, where the ambient temperature may be above 40 deg. C.
3. It will be applicable especially in cases where there is a great variation in load. As the tank is provided with a large radiating surface, it will always have some self-cooled rating, approximately 40 to 50 per cent of the maximum rating without air jets applied.
4. It may be erected anywhere, indoors and outdoors. The radiators may be attached directly to the tank, or may be banked and located outside with the transformers inside the building.

Method of Handling Boiler Room Labor

BY W. G. SHURGAR
Superintendent of Power Stations, Arkansas Central Power Company, Little Rock, Ark.

RATHER than specify too many rules regarding the operation of boilers, the Arkansas Central Power Company finds it better to have the boiler room foreman watch how the men handle their jobs and then correct them if they are wrong. It finds that this develops initiative, does not fill the minds of men with apparently arbitrary "don'ts," and leaves more impressive lessons.

Such procedure has been found practical because of the method of promotion in the boiler room. Men are broken in as stoker keeper and rise to foremen, the latter being used to train the new hands.

Rules are given, however, for the division of load among boilers.

Commercial Activities and Public Relations

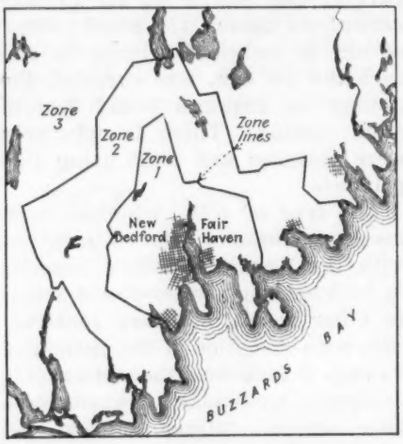
Zone Rates to Encourage New Business

A ZONE SYSTEM of rates for service throughout its territory in connection with a general reduction in charges resulting from increased business was recently inaugurated by the New Bedford (Mass.) Gas & Edison Light Company. The adoption of the zone system is the outcome of various extensions of lines into suburban and rural areas. For some time the management of the company has desired to establish uniform prices of service as a means of encouraging development of business in the outlying districts, and the zone rates provide a degree of standardization that has considerably simplified this problem.

Three zones are established: (1) City of New Bedford, the town of Fairhaven and parts of Acushnet and Dartmouth; (2) Mattapoisett and parts of Acushnet, Dartmouth, Freetown and Westport, constituting an intermediate zone between the inner and outer zones; and (3) parts of Freetown, Lakeville and Westport. The new lighting rates make a reduction in the first zone of from 10 cents to 9 cents per kilowatt-hour for the first 500 kw.-hr., followed by steps down to a minimum rate of 4.5 cents gross. In the second zone the reduction is from 13 to 12 cents per kilowatt-hour for the first 500 kw.-hr., with a minimum of 7.5 cents gross, and in the third zone the former price of 15 cents per kilowatt-hour is continued, with a 9.5-cent minimum gross rate for the highest total of energy consumption. In each zone there is a minimum charge of 75 cents per month (except by express agreement in the third zone). For prompt payment of bills there is a 5 per cent discount in the first zone, and in the second and third zones 1 cent per kilowatt-hour is deducted for punctuality in settling.

The general power rate in the first zone ranges from a maximum of 7 cents to a minimum (gross) of 1.6 cents, and in the second and third zones it runs from 8 cents to 2.6 cents, with a 5 per cent prompt payment discount in all zones and a minimum charge of $2 per month in each.

The domestic cooking, refrigeration and heating rate in the first zone is 10 cents per kilowatt-hour for the first 20 kw.-hr., and 3 cents for all excess, the corresponding rates for the second and third zones being 11 and 4 cents. In all zones the minimum charge is $2 per month and the prompt payment discount is 5 per cent. Energy is metered separately on this rate.



THREE RATE ZONES ARE USED AT NEW BEDFORD

Contract power rates are not zoned, and these range from 2.1 to 0.85 cents, with additional adjustment for coal costs.

Ranges Serviced at Net Cost of Forty Cents per Call

FOR SEVERAL YEARS the Minneapolis General Electric Company has followed the practice of charging customers for repairs and servicing of electric ranges on which the guarantee period had expired. In adopting this policy it is not the company's intention to make a profit on this work, but it believes that the pioneering period is virtually past and hopes ultimately to make its range servicing department self-supporting. The accompanying table, which compares range service costs for the years 1923 and 1924, shows a decrease in the last year of 37.5 per cent in the net average unit cost, indicating that in a few more years the maintenance of electric ranges will not be considered a liability.

There are now nearly 5,500 electric ranges in use in Minneapolis. During 1923 the company made 5,950 service calls at a gross total expense for labor and material used of $9,981.97. Customers were billed a total of $6,171 for this work, making the net cost per unit call $0.645. In 1924 more ranges had been sold and 6,773 service calls were made at a gross expense of $11,978.08. Charges for servicing amounted to $9,288.16, leaving a net cost per unit call of $0.403.

H. E. Young, sales manager, attributes this decrease in net service call expense to education of the user in the operation and maintenance of the range, to improvements in the design and construction of ranges themselves and to the effect of previous repairs made by the company's service men.

Service Annuity Adopted for Employees

INAUGURATION of a service annuity plan in the Calumet Gas & Electric Company, Gary, Ind., through which employees will be retired with pensions as a reward for service, has been announced. Men employees who attain the age of sixty-five years while in the service of the company and women employees who attain the age of sixty years while in service will be eligible for retirement with a pension. This applies to employees who have already reached or passed the retirement age.

ANALYSIS OF ELECTRIC RANGE SERVICE COSTS, NORTHERN STATES POWER COMPANY, THE MINNEAPOLIS DIVISION

No. of Men	No. Calls	Salary and Expense	Cost of Material Used	Gross Total Expense	Revenue From Billing	Net Total Exp.	Cost per Unit Call	Av. Yr. Kw.-Hr. per Range	Cost of Serv. per Kw.-Hr. Year	Customer Billing, Per Cent of Total Expense
					1923					
2	5,400	$5,400.00	$4,581.97	$9,981.97	$6,171.00	$3,810.97	$0.645	1,800	$0.0003	62
					1924					
2	6,773	$5,430.58	$6,547.50	$11,978.08	$9,288.16	$2,689.92	$0.403	1,800	$0.00022	78

The annuity for each employee retired will be an amount equal to 2 per cent of the average annual salary for the period of his or her continuous service to the date of retirement, multiplied by the number of years of service, not to exceed an amount equal to 50 per cent of the employee's rate of pay during the last year of service. The maximum pension will be $3,000 a year.

In addition the plan provides that men employees who attain the age of sixty years, and women employees who attain the age of fifty-five years while in service may be retired on an annuity upon request, provided they have been in the service of the company continuously for twenty years or more. The percentage of the final rate of pay for maximum annuity for those who retire voluntarily will range from 40 to 48 per cent, instead of 50 per cent.

Employees of the company will not be required to make any payments into the annuity fund, as the company will maintain the fund and the payment of pensions as a reward for faithful service.

At the past two Christmas seasons all employees of the company who had been on the pay roll six months or longer received paid-up life insurance policies ranging from $500 to $1,500, depending on the length of service.

ELECTRICAL ADVERTISING INCREASED THE CONNECTED LOAD FROM 12 KW. TO 100 KW. AND ADDED $9,000 IN ANNUAL REVENUE TO THE POWER COMPANY

Profitable Load in Electrical Advertising

ELECTRIC SIGNS and outdoor advertising in the form of illuminated billboards offer a very profitable load for the central-station company, and the Minneapolis division of the Northern States Power Company carries on a continuous effort to install new signs as well as remodel and relamp old signs. Results obtained have been most satisfactory and the additional new business of this class that has been connected to the company's lines earns approximately $100 in gross annual revenue per kilowatt connected. Men's clothing stores and women's specialty shops have been particularly quick in capitalizing on the value of spectacular electrical advertising—one store having increased its sign load 800 per cent. A few of the newer electric signs in Minneapolis are shown in the accompanying cuts.

NO. 1. CLOTHING STORE SIGN THAT ADDED 42 KW. IN CONNECTED LOAD EARNS $4,000 ANNUAL REVENUE

NO. 2. HIGH-INTENSITY ILLUMINATION OF THIS BILLBOARD USES 10,000 KW.-HR. YEARLY

NO. 3. SOME OF THE ELECTRIC SIGNS INSTALLED IN THE MINNEAPOLIS COMMERCIAL DISTRICT

Scattered Experiences with Farm Applications

RESULTS of any tests are of little application unless all the conditions are known. However, the possibilities of effecting economies on farms and thereby increasing rural loads to a point where rural lines can be operated to the profit of utilities and users are indicated by a few results from the Ripon, Wis., experimental power line.

According to E. R. Meacham, who was in charge of this project but who is now rural electric service engineer for the Wisconsin Power & Light Company, Madison, the following figures on the consumption and cost of electricity for various farm jobs were obtained.

Milking—2 to 6¾ cents per 100 lb. milk (depending on operator and other factors); 23 to 57 minutes per 100 lb. compared with 84 minutes by hand; 12 to 60 kw.-hr. per month for herds of eight to twenty-five cows; less than ½ cent per cow for energy.

Separating Cream—28-watt-hr. per 100 lb. milk; 0.7 cent per 100 lb.

Heating Water for Dairy.—65 to 75 kw.-hr. per month.

Pumping Water.—20 kw.-hr. per month for average farm; 8 cents per 1,000 gal. by pressure tank method.

Hatching Chicks.—An average of 200 kw.-hr. per month on the four experimental farms for hatching and brooding; 2½ cents each for hatching.

Electric Range.—116 kw.-hr. per month for six-person family; electric range with firebox more practical for heating of kitchen in winter.

Grinding Feed.—$1 per ton; ½ kw.-hr. per 100 lb. rye; twice as much for oats; half as much for corn; 1.1 kw.-hr. per 100 lb. for bone.

Cleaning and Sacking Grain.—1¼ kw.-hr. per 100 bu. grain.

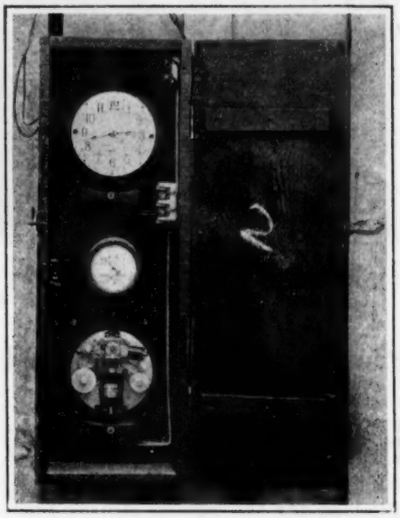
Putting Hay in Mow.—0.4 kw.-hr. per ton hoisted.

Sawing Wood.—1½ kw.-hr. per cord.

Ironer (44 in.).—8 kw.-hr. per month for five persons.

Whereas the economics of the situation are important, says Mr. Meacham, the psychological side is equally if not more important. That is, if the farmer can be shown how he can carry on his work with less drudgery and more general satisfaction, he will demand less economic justification.

Range Survey in Northwest



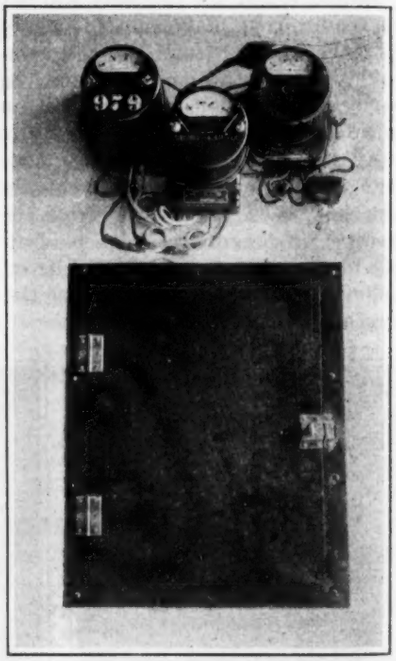
SPECIAL DEMAND METER WHICH TOTALIZES CONSUMPTION OF INDIVIDUAL TEST METERS AND SHOWS TOTAL DEMAND OF TEN TEST METERS

ELECTRIC range tests being made in the Pacific Northwest by the special range committee of the electric heating and cooking committee of the N. E. L. A. are progressing satisfactorily and will be completed in ample time to enable the committee to present a complete report at the 1926 national convention according to Lewis A. Lewis, chairman.

The tests are being conducted on the systems of the Washington Water Power Company and the Idaho Power Company, where conditions are ideal for the purpose. The city of Spokane was chosen as typical of a medium-sized city with a high degree of range saturation, and the towns of Payette, Idaho, and Ontario, Ore., and surrounding territory were taken as typical of small farming towns and farming communities. Three sets of tests are being made—spring, summer and winter. The spring tests have been made in Spokane and summer tests are now in progress in and around Payette and Ontario.

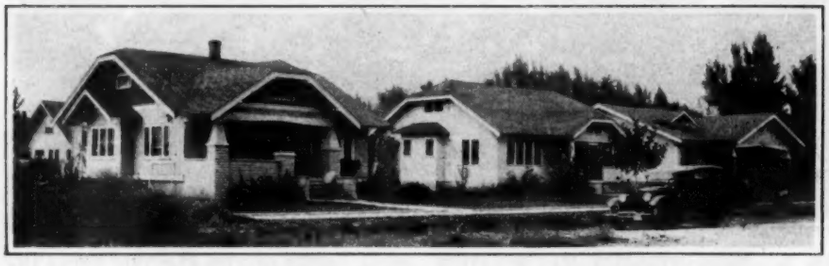
One hunded and fifty ranges divided into groups of ten are tested at one time. A special contact-making watt-hour meter is installed at each residence included in the test. Ten of these meters are connected by pilot wires to a special demand meter, which totalizes the registration of all of the individual meters and prints the demand at fixed intervals.

Separate 30-day tests are made on ranges, water heaters and lights in the same residences, giving data on kilowatt-hour consumption, demand and diversity, which will be used in compiling the report. From these



CONTACT MAKING WATT-HOUR METER INSTALLED WITH RANGE AND WATER HEATING METERS UNDER TEST

data will be computed the size of transformers, secondaries, service wires, meters, etc., necessary to serve ranges. The tests are being conducted under the supervision of the commercial section of the N. E. L. A., and field work is being carried out under the direction of competent central-station engineers, who have been made members of the special committee. Every effort is being made to have the data absolutely correct in order that the true value of the electric range load can be appraised on an engineering basis.



TYPICAL HOMES IN ONTARIO, ORE., WHERE RANGE TESTS ARE BEING MADE

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Test Code for Steam Turbines.—This tentative draft, one of a series of nineteen being formulated by the A. S. M. E. committee on power test codes, takes up in detail the results to be obtained, essential and secondary data, conduct of test, corrections for operating conditions, calculation of results and form of reporting data and results.—*Mechanical Engineering*, September, 1925.

Results Obtained with a Southwest Coal.—Data are given on a steaming test with coal (stoker-fired) having, on a dry basis, 33.87 per cent of volatile combustible, 47.22 of fixed carbon, 18.91 of ash and 0.90 of sulphur, showing 8.615 lb. of water evaporated from and at 212 deg. per pound of dry coal. The equivalent evaporation per square foot of heating surface was 5.29 lb.; the boiler and furnace efficiency was 70.2 per cent.—*Power Plant Engineering*, September 1, 1925.

Continental Hydro-Electric Activity.—GEORGE BROCKNER.—One of the more important stations now approaching completion on the Continent is that at Wäggisthal, Switzerland, for the city of Zurich and the Northeast Swiss Electricity Works. The total head is 120 m. A huge dam across the valley will permit of storing the entire volume of water available in a reservoir of 140,000,000 cu.m. Four other large plants, aggregating 173,000 hp., are under construction.—*Electrician* (*England*), August 28, 1925.

Generation, Control, Switching and Protection

Swiss and Foreign Oil Switches.—D. HEUSSER.—The author gives a review of modern high-voltage oil circuit breakers, as manufactured by twelve concerns. The most characteristic data and twenty-four photographs are given. Breakers of up to 1,500,000-kva. rupturing capacity are described.—*Bulletin de l'Association Suisse des Electriciens*, July, 1925.

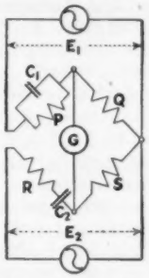
Parallel Operation of Hydro and Steam Plants.—F. A. ALLNER.—In this paper, which was presented at the spring meeting of the American Society of Mechanical Engineers, the author discusses some of the operating and economic features that should receive consideration in mixed systems.—*Mechanical Engineering*, September, 1925.

Supply of Electricity in Great Britain.—An abstract is given of the statistical abstract published by the Electricity Commissioners for the year 1924-25. Returns were received for 584 generating stations. The total output was 7,415,000,000 kw.-hr., of which 7,090,000,000 kw.-hr. was generated in steam-operated stations. These figures are for public supply undertakings; it is estimated that about half as much is generated in private plants. The average coal rate per unit generated was 2.53 lb. The best, 1.51 lb., is returned for the new Barton station in Manchester. This is in striking contrast with the small stations, with an annual output of less than 50,000 units, which have an average coal rate of 21.60 lb. per kilowatt-hour and a thermal efficiency of perhaps not more than 3 per cent. Comparisons are also instituted between steam and Diesel-engine operation.—*Engineering* (*England*), August 7, 1925.

Units, Measurements and Instruments

Firedamp Indicators.—A recently concluded prize competition for firedamp detecting apparatus has brought forth a number of promising ideas and constructions, none, however, reliable and simple enough to deserve the provided prize. The article describes the various models submitted.—*Elektrotechnische Zeitschrift*, July 30, 1925.

Measurement of Dielectric Losses at High Voltages.—B. HAGUE.—The measurement of the dielectric losses in high-voltage cables is a matter of increasing importance in electrical engineering. The Wien bridge has long been used,



METHOD OF MEASURING THE DIELECTRIC LOSSES IN HIGH-TENSION CABLES

but has been modified to advantage by later workers. R. W. Atkinson has recently introduced a new principle, by applying a lower voltage to the arm of the bridge containing standard condenser than to the arm that contains the sample of cable. This is represented in the figure, where C_1 and P are respectively the capacitance and shunted resistance of the cable and C_2 the standard condenser. The present paper discusses the theory of this method, first treating the general case of double supply in an impedance network and then making approximations that are permissible for the Atkinson bridge and obtaining correspondingly simplified equations, namely $C_1 = SC_2/KQ$, where K is the voltage ratio and $\cos\phi = \omega C_2 R + \omega C_2 S - \omega C_1 Q$, which are the same as those given by Atkinson.—*World Power*, August, 1925.

Transmission, Substations and Distribution

Rectifiers: Nos. III-VI.—Previous parts of this serial have been noted. Those now published deal with single-phase and multiphase rectification up to twelve-phase, using the mercury arc. Rectifiers of the metal-incased type are now made for 475, 1,000 and 1,500 amp. at 500 volts. The construction of these large units, with their accompanying vacuum pumps and gages, is described and illustrated. Part V deals with the tungar rectifier. Part VI deals with electrolytic rectifiers of the aluminum cathode type.—*Engineer*, August 7, 14, 21 and 28, 1925.

Calculation of the Electrical Problems of Transmission by Underground Cables.—DONALD M. SIMONS.—The mathematical data and formulas for calculating the electrical problems in the transmission of power by underground cables are scattered throughout the literature of the subject. The author has assembled those which he considers best adapted to the practical calculation of such problems.—*Electric Journal*, August, 1925.

Calculation and Regulation of Voltage on Three-Phase Lines.—O. I. BURGER.—The author develops vector diagrams for the three main classes of transmissions—i.e., short lines, where only ohmic and inductive resistance has to be considered; medium-length lines, where capacity and imperfect insulation must be added, and very long lines, which require exact evaluation of all factors. Examples for each of these cases serve to explain the simple vectorial solutions.—*Elektrotechnische Zeitschrift*, Aug. 27, 1925.

Motors and Control

The New "York" Motor.—A machine is described that develops a relatively high starting torque by a combination of phase splitting, regrouping of stator windings and the use of a modified form of squirrel-cage rotor. With one and one-half times full-load current 50 per cent of full-load torque is obtained; with an increase of current this can be raised to 100 per cent. There are no idle stator coils. The quadrature windings, differentially connected, are also in circuit under running conditions. The winding, functioning and characteristics are discussed in considerable detail with diagrams, performance curves and oscillograms.—*Electrician* (*England*), July 17 and 24, 1925.

Squirrel-Cage Armature Motor.—E. ROSENBERG.—The use of this type of alternating-current induction motor, according to the author, should be encouraged for sizes far beyond the capacities now permissible. Even on small networks a 5-hp. motor of this type should not cause any appreciable voltage fluctuations during the exceedingly short starting period. However, a star-delta switch should be used for putting all such motors over 3 hp. on the line. Oscillographic studies have shown that it is not worth while to complicate such switches by an arrangement whereby the current is not interrupted when going from star to delta connection.—*Elektrotechnik und Maschinenbau*, July 26, 1925.

Explosion-Proof Motors.—H. KNÖPFEL.—Motors intended for use in mines with fire-damp possibility must be so designed as to be either hermetically sealed, or, if ventilated, their air supply must be carried through fire protective passages. These two types of motors are described in this paper. Preference is given today to motors where the sparking parts are hermetically inclosed. Smaller motors with centrifugally controlled starting resistance have the centrifugal contacting part totally inclosed, while larger

motors are made with inclosed collector rings. The article gives, in its second part, detailed data of explosive gas and air mixtures and pressure records of such mixtures.—*Brown-Boveri Mitteilungen*, August, 1925.

Illumination

Quartz Lamp for Analysis.—L. J. BUSSE.—A new lamp has recently been perfected and placed upon the market which furnishes a large amount of ultra-violet light but excludes all other light visible to the eye. The lamp is a specially designed mercury-vapor lamp in a quartz tube, which burns in a totally closed, light-tight chamber. At the lower part of this chamber is a suitable filter which absorbs all but the ultra-violet rays. Operating in a dark room, the lamp cannot be seen with the eyes, but any material brought within the range of the downward directed beam of ultra-violet light will be seen in its characteristic fluorescent light.—*Elektrotechnische Zeitschrift*, August 6, 1925.

Illuminating Engineering Nomenclature and Photometric Standards.—The definitions and data here published are those approved by American Engineering Standards Committee as "American standard," April 29, 1925. A number of them are, furthermore, in accordance with definitions adopted by the International Commission on Illumination in 1924. Among the latter is a table of values of the relative visibility factor for every ten millimicrons from 400 to 760. The term "apparent foot-candle" has been replaced by the "foot-lambert" as a unit of brightness equal to 1.076 millilamberts.—*Transactions I. E. S.*, July, 1925.

Electrophysics, Electrochemistry and Batteries

Electrodeposition of Rubber.—S. E. SHEPPARD and L. W. EBERLIN.—Rubber particles in natural latex (ammoniated) and in artificial rubber dispersions in water are negatively charged. In an electric field they move to the anode. The effect has been used previously to coagulate raw rubber electrically. It has been found possible to admix pigments, accelerators, latex or rubber-in-water dispersions with sulphur, and by electrolysis to deposit rubber compounds, integrally, upon both metals and other materials to form coherent, homogeneous layers of considerable range of thickness. These deposits can be vulcanized. The process can be used to produce a continuous coating on sheet, wire and fabrics and to impregnate the latter. Thicknesses up to 0.391 cm. (0.15 in.), measured after vulcanization, have been thus deposited, using currents up to 1 amp. per square inch. The voltages used in the experiments ranged from 10 to 105, being dependent apparently upon the distance between electrodes and the current density.—*Industrial and Engineering Chemistry*, July, 1925.

Permanent Magnets in Theory and Practice.—S. EVERSHED.—Space limitations permit only a bare indication to be given of the scope of this eighty-five-page monograph, which embodies the results of prolonged research. The present contribution, designated as "second paper," follows one on the same subject published five years ago and containing the first two parts of the study. Part III now treats the metallurgy of magnet steel as a material for permanent magnets. Part IV opens with a general account of the manufacture of permanent magnets, beginning with the making of the steel. The different stages of manufacture are then dealt with, attention being mainly directed to points of difficulty and matters in which common practice stands in need of amendment.—*Journal of the I. E. E. (England)*, August, 1925.

Heat Applications and Material Handling

Materials of Construction for Very High Temperatures.—A table by H. von Wartenburg of the Danzig Technical School is quoted from *Fuels and Furnaces*. It gives for a number of materials the highest possible temperature, the substances by which they are attacked and those to which they are permeable.—*Chemical and Metallurgical Engineering*, August, 1925.

Electric Heat-Treating Furnace Applications.—E. A. HURME. *Electric Melting Furnaces.*—J. A. SEEDE. *Heating of Ingots by Electricity.*—RALPH A. BUTLER.—This group of papers is published in connection with the report of the electric heat committee to the annual convention of the Association of Iron and Steel Electrical Engineers. The papers contain descriptions and data relating to the present state of the art.—*Iron and Steel Engineer*, September, 1925.

Electric Shovels.—D. J. SHELTON and D. STOETZEL.—This article compares the operating characteristics and relative advantages of several types of electric shovels used in mining with those driven by steam. It includes duty-cycle charts obtained with recording meters. An abstract may be found in the report of the A. I. E. E. spring convention in the ELECTRICAL WORLD for April 25, 1925, page 862.—*Journal of A. I. E. E.*, August, 1925.

Traction

New Haven Electrifies Danbury Branch.—H. F. BROWN.—Steam has been replaced by electrical operation at 11,000 volts, 25 cycles, on the section of the New York, New Haven & Hartford Railroad between South Norwalk and Danbury, Conn., a single-track line about 25 miles long. Inductive interference with adjacent communication lines along paralleling highways is reduced by the three-wire system of distribution, using balancing autotransformers at each end and at the middle of the section. Operation is now conducted as a part of the previously existing service at the same voltage on the main line into New York. Details of the construction methods are given, with illustrations.—*Electric Railway Journal*, August 29, 1925.

Electric Locomotives.—A brief description was given in the *Digest* (November 1, 1924, page 960) of a proposed new electric locomotive for the Detroit & Ironton Railroad. This engine has been completed and placed on test on the four-mile section of the road now equipped with overhead trolley. The present article gives many items of specific information in regard to it.—*Railway Age*, August 29, 1925.

Telegraphy, Telephony, Radio and Signals

Prevention of Radio Interference on Air Ships.—V. S. KULEBAKIN.—A new system of protection against interference from the ignition system is described which is theoretically sound and has given complete satisfaction, in actual service eliminating entirely disturbing telephone noises. The principle of the new invention is the use of metallic chains instead of wires, for all electrical connections on the radio apparatus. An elaborate theoretical study, making use of Heaviside's formulas, shows the properties of chains as conductors and their influence upon the wave radiation from them. It also discloses that the exact type of chain required for each particular case must be determined mathematically in order to fulfill the purpose sought.—*Elektrotechnische Zeitschrift*, July 16, 1925.

Re-radiation from Tuned Antenna Systems.—HENRY C. FORBES.—A theoretical and experimental investigation was undertaken to determine the magnitude and characteristics of the disturbances of the field due to a distant sending station in the vicinity of a tuned antenna. The paper first finds correction factors for the field in the immediate vicinity of the radiating antenna to be applied to Dellinger's radiation formula, using an "equivalent height" obtained by electrical measurement to take into account such effects as that of nearby objects of which the formula cannot take cognizance. These factors are then applied to compute the field from the re-radiating antenna.—*Proceedings I. R. E.*, June, 1925.

Miscellaneous

Electric Ship Propulsion.—CHARLES RETTIE.—The author begins a general review of the present situation with regard to electric ship propulsion by the remark that during the last few years there has been very little if any development in England or on the Continent, it having remained with the Americans to make any real progress. A digest follows of recent papers and discussions at meetings of engineering societies which throws light on tendencies as to turbine-electric and Diesel-electric drive.—*Electrician (England)*, July 31, 1925.

Electricity in Agriculture.—A committee of the (British) Institution of Electrical Engineers appointed to study the various aspects of the use of electricity in agriculture has made a report giving its conclusions regarding uses to which electricity can be put, capital outlay, existing schemes and steps which might be taken by the Institution to promote further developments. Recommendations are made that the Institution take steps to initiate experimental work for improving the efficiency of farm implements and machines, improving the efficiency of methods of crop treatment, and to carry out investigations to provide useful data.—*Journal of the I. E. E.*, August, 1925; also, slightly abbreviated, *Electrician*, August 21, 1925.

News of the Industry

Next Year's N. E. L. A. Convention at Atlantic City

The forty-ninth convention of the National Electric Light Association will be held on Young's Million-Dollar Pier, Atlantic City, N. J., from Monday, May 17, to Friday, May 21, inclusive. Contracts have been signed and general plans for the convention completed. A manufacturers' exhibition will be held in connection with the convention. The exhibit will be on the Million-Dollar Pier, as in previous years, and it is anticipated that more space than ever before will be devoted to the exhibits. The exhibition committee is now at work on floor-space plans and general arrangements and will be prepared to make definite announcements in the near future.

No Licenses on Upper Tennessee Pending Report

Assurances have been given the Muscle Shoals Commission by Acting Chairman Davis of the Federal Power Commission that no applications for rights on the upper Tennessee River will be granted pending the formulation of the commission's report, which must be ready November 15. Acting Secretary Davis gave this assurance when advised by the staff of the Federal Power Commission that no one of the eleven applications on the upper Tennessee would be laid before the commission, in the ordinary course, prior to November 15.

The only one of the eleven applications which is in final form is that of the Hiawassee River Power Company. The death of the president of that corporation, however, has given rise to uncertainties which would have precluded the consideration of that application had there been no request from the chairman of the Muscle Shoals Commission.

Industrial Lighting Campaign Gets Under Headway

Reports received from various parts of the United States and Canada indicate that the industrial lighting activity being carried out this fall by the industrial lighting committee of the N. E. L. A. under the direction of J. F. Becker as chairman will be an unqualified success. More than one hundred cities have already ordered material to carry the campaign to about sixty thousand industrial plants, and it is expected that before the activity is finished two hundred thousand industrial plants will be told the story.

The plan of the campaign is for the local electrical leagues and central-station companies to organize a direct mail campaign among the industrial plants of their community by sending out, about ten days apart, three broadsides extolling the benefits of better factory lighting. This is supplemented by an advertising account of the industrial lighting campaign in eighteen national trade, class and management magazines and a local newspaper campaign by the electrical interests.

This direct mail campaign is to be followed up by personal solicitation by salesmen representing central-station companies, manufacturers and jobbers and by electrical contractors. Lighting lay-outs will be made for factories whose interest has been aroused, and in some cases trial demonstations will be installed in the factories. Three field men—M. C. Turpin of the Westinghouse Electric & Manufacturing Company, Roy A. Palmer of the National Lamp Works and W. H. Rademacher of the Edison Lamp Works—have been loaned to the industrial lighting committee, and these men are touring the country, explaining the activity to the local interests and assisting them to organize for the campaign.

Local campaigns can be operated any time before next March. The committee is issuing a semi-monthly publication, entitled *Industrial Lighting News.*

Alex Dow Denounces Speculation

President of Detroit Edison Company Emphatically Condemns Trading in Its Shares at Inflated Price—Such Buyers "Kiss Money Good-by," He Says

ADDING his voice to those already raised in criticism of speculative purchases of electric light and power company stocks, Alex Dow, president of the Detroit Edison Company, said very recently in a widely published statement that he could not understand any "sane management of any holding company" buying into any public utility company in Michigan at such inflated prices as are rumored to have been offered for Detroit Edison shares. There was nothing in the company's business or the company's prospects, he declared, which warranted a spectacular rise in the price of the stock. The additional stock issue of 10 per cent, recently accounced as an offering to present stockholders, was required for the natural growth of the company's business, he continued, and there "every dollar of the money" would go.

"The talk is that some holding company or other—three at least have been named—is willing to pay up to $200 a share for control," Mr. Dow is quoted as saying. "Assuming that the holding company began buying long ago at $100 and can now buy control at an average of $150 a share, which figure is too low but will serve to illustrate, the stock outstanding, including the new issue, will be nearly $80,000,000, and they will have to buy $40,000,000 with a fifty-point rise above the amount of money which has been put into the property.

"The property has earned and will earn a liberal return on every dollar that has been put into it. We serve our public well, and they do not grudge the return to us, but if the people who have bought control have spent $20,000,000 in money which never went into the property they might just as well kiss that money good-by; they will not be allowed to earn a liberal return upon it. Any one who is watching the signs of the times will see that this State of Michigan is no place to try such an experiment."

Mr. Dow said he was answering persons who had made personal inquiries of him and that he would be "ashamed to be mixed up" in the speculation in the shares.

Detroit Edison common stock established a number of successive new "highs" in the two weeks preceding Mr. Dow's statement. Following this utterance the stock broke eight and a quarter points. The highest point reached was 159½.

North American Wins Suit

Wisconsin Court Finds for It in Dispute with Wisconsin Public Service Corporation Over Rights

CONTENTION between the Wisconsin Public Service Corporation, a Byllesby-controlled company, and the Wisconsin Gas & Electric Company, a North American Company subsidiary, over the right of the latter to build a transmission line from Green Bay north to Niagara, Wis., to connect the Lakeside plant of the Milwaukee Electric Railway & Light Company with the water-power plant of the Peninsular Power Company in upper Michigan, has resulted in a finding by local courts sustaining the Wisconsin Gas & Electric, the judges granting a petition of this company for condemnation of the necessary right-of-way. It was held by the courts of Brown and Oconto Counties, sitting jointly, that the North American Company was acting in good faith, since much of the line has already been built, and that if the lands are later turned over to private parties, the titles will revert to the original owners. A similar action is pending in Marinette County.

The case may be appealed by the Byllesby interests, which charge invasion of territory. The Wisconsin Gas & Electric Company, as already re-

ported in the ELECTRICAL WORLD (August 22, page 381), plans to use the portion of the line that will lie between Amberg and Green Bay jointly with the Northern Paper Mills Company, and the Wisconsin Public Service Company maintains that by this arrangement the paper mills could use steam-generated power from the lines of the central-station company when their own hydro-electric plant at Amberg was insufficient, energy being thus served to a consumer in the territory of the Wisconsin Public Service Company without a certificate of convenience and necessity from the Railroad Commission. The court ruled that such a certificate was unnecessary for a transmission line merely passing through a territory it does not serve and accepted the assurance of the North American Company that the paper-mill company's line would not be tapped and that the lines would be sealed.

Augusta-Aiken Company Pushing New Construction

The Augusta-Aiken Railway & Electric Company is spending approximately $2,000,000 this year in developing and distributing power in a radius of 50 miles around Augusta, Ga., according to officials of the company. The company, in fact, is engaged in one of the most active programs now under way in the South. Its major enterprise is the construction of a 110,000-volt line from Toccoa, Ga., to the Stevens Creek plant of the concern, 7 miles above Augusta on the Savannah River. This will tie the system of the Augusta-Aiken Railway & Electric Company up with the so-called "Southern superpower zone," the connection being made through the lines of the Georgia Railway & Power Company.

In addition to this, the Augusta-Aiken company is adding 60 per cent to the capacity of its main generating plant on the Savannah River above Augusta. Up to the first of this year this station consisted of five generators of approximately 3,000 hp. each. The company is adding this year three more generators of the same capacity. One of these was completed and thrown on the line on April 20. The other two units are now under construction and should be ready for operation the latter part of this year or the first of next. This addition will enable the company to furnish primary power at all times for the demand on its system and have a sufficient supply of surplus power to meet the normal growth of the community.

The company also has a line under construction which now reaches Blythe, Ga., on the extreme limit of Richmond County, and it expects soon to build a 44,000-volt line through Thomson, Harlem and Campania to Union Point, with laterals reaching Washington, Warrenton, Jewell and other points in this immediate territory. In South Carolina it has one 44,000-volt line now reaching as far as Williston and another line of the same capacity extending to within 3 miles of Edgefield. All of the company's 13,000-volt and 44,000-volt lines are being reinforced, larger copper being used to make the facilities more serviceable to industries. Finally, several substations are being installed at strategic points to receive the added power and distribute it through the community.

Alabama Power's Peak Load

All Records Were Beaten When Steam Reserves Came to the Rescue of Drought-Stricken Plants

DESPITE the great drought, which has reduced the level of Alabama's streams to the lowest stage in history, thus also reducing to a minimum the capacity of the hydro-electric plants, the Alabama Power Company on September 8 last made the greatest output in its history, according to President Thomas W. Martin. The figure, 4,093,966 kw.-hr., surpassed by 169,806 kw.-hr. the previous high record, made on July 30 of this year.

Only a bare 10.3 per cent of this total was supplied by the company's hydro-electric plants, the remainder being steam-generated. Not only were Alabama's needs fully met, but the company was able to supply connected companies in the Southeastern power zone with 21.8 per cent of all energy produced on that day, Georgia alone receiving 892,000 kw.-hr. To meet demands it was necessary for the Alabama Power Company to press into service several small plants not usually operated. Among these were the steam plants at Montgomery and Sheffield City, which produced 2.6 per cent of the total load. The Gorgas plant contributed 41.5 per cent of the load and the government steam plant at Sheffield carried 33.4 per cent.

The Alabama Power Company on the day mentioned burned 3,175 tons of coal in its five largest plants. It now consumes daily from 2,500 tons to 3,000 tons in excess of the supply from its own mines. The Gorgas steam plant, which is located at the mouth of a coal mine and which began the dry season with 100,000 tons in storage, has exhausted its reserve and is burning fuel in excess of the mine capacity, but the bulk of all coal now being purchased goes to the government steam plant at Sheffield, which the company is operating at full capacity for the relief of industries in Georgia and the Carolinas. "The fact that the wheels of Alabama's industries have never slackened their pace during the present critical situation is a striking example of the need for adequate steam-reserve facilities," declared Mr. Martin. "We are not only meeting every need for energy at home but are able to go to the aid of other states not so well provided with steam reserve equipment."

The Alabama Power Company's purchases are proving an aid to steady production at the mines. Virtually all of the mines supplying the coal are electrified from the company's lines. From September 16, 1924, to September 16, 1925, the company generated 1,010,169,208 kw.-hr., exceeding by 184,022,863 kw.-hr. the generation for the same period during 1923-4 and shattering every yearly record established by this power company. The maximum coincident five-minute load on the company's system during the year — 306,000 hp. — was reached at 11 a.m. on September 16, when the Georgia Railway & Power Company was receiving 4,800 hp. and the Columbus Electric & Power Company was drawing 32,000 hp. In the 1923-4 period the company's output was 72 per cent hydro and 28 per cent steam; during the same twelve months in 1924-5 the output was 47 per cent hydro and 53 per cent steam.

Alabama Power Company's Transmission Plans

A petition has been filed with the Alabama Public Service Commission by the Alabama Power Company asking for permission to construct an electric transmission line from a point on the power company's system at or near Sheffield to Gadsden, a distance of 112 miles, together with a branch line from Cullman south to Fulton Springs, a distance of approximately 38 miles, with substations and other necessary equipment. Although no reference to Muscle Shoals is made in the petition, such a transmission line could be used to carry Muscle Shoals power into the system of the Alabama Power Company and also to facilitate interchange of power between the Tennessee River hydro-electric developments and the water-power developments which have been and are to be built by the company in the Coosa and Tallapoosa River basins. The voltage proposed is 150,000, higher than that at which any company in the South now operates.

An order has also been issued by the Alabama Public Service Commission granting a certificate of convenience and necessity to the Alabama Power Company for the construction of an electrical transmission line from a point near Lock 18 on the Coosa River near Wetumpka in Elmore County to Cuba in Sumter County, a distance of approximately 135 miles, with distribution line or lines approximately 13 miles long, connecting the towns of Cuba, York and Livingston with the transmission line referred to and a primary substation at or near Cuba and three secondary substations, one each at Cuba, York and Livingston. The town of Cuba is about 5 miles from the boundary line of Mississippi, and it is understood that the furnishing of power over this line to the Mississippi Power Company is contemplated. The total cost of the transmission lines and substation is put at $1,500,000.

Eastern Shore Gas & Electric Changes Hands

The National Public Service Corporation—holding company for the A. E. Fitkin properties—has just purchased the Eastern Shore Gas & Electric Company from Day and Zimmermann of Philadelphia. This property furnishes electric light and power service over a wide area in southern Delaware and the Eastern Shore region of Maryland. The headquarters of the company are at Salisbury, Md. The power plants are at Salisbury, Ocean City, Md., and Laurel, Del. The new management expects to extend the territory served by the company and to make improvements to the present property.

A. E. S., Visiting Muscle Shoals, Discusses Fertilizers

At the forty-eighth annual meeting of the American Electrochemical Society, held at Chattanooga and Muscle Shoals, September 24 to 26, the principal feature of the technical program was a symposium on the relation of the electrochemical industry to the production of fertilizers. The symposium embodied eight papers covering the economic, production and application aspects of fertilizers. The electrochemical industry would play an important part in the production of synthetic ammonia from electrolytic hydrogen, phosporic acid in the electric furnace, ammonium phosphate and similar salts as concentrated chemical fertilizers. There is no immediate prospect of such developments, however, because although synthetic ammonia and phosphoric acid are now being manufactured commercially, they are used for a variety of industrial and technical purposes with no immediate outlook for their use in fertilizers. This situation has a definite bearing on the controversy over Muscle Shoals, which certain factions contend should be made a great fertilizer manufacturing center. The discussions at the Chattanooga meeting would indicate that Muscle Shoals has no special advantages as a fertilizer manufacturing center unless concentrated fertilizers should come into use. Since this is not imminent, Muscle Shoals loses its importance as a factor in the fertilizer industry of the country.

Other papers on the technical program dealt with electrodeposition of metals and alloys, including chromium, nickel and copper-nickel.

The meeting was marked by the hospitality and social features characteristic of the South. Establishing the headquarters at the Signal Mountain Hotel was effective in concentrating attention on both business and social functions. The trip to Muscle Shoals included inspection of the Wilson Dam and power house and Nitrate Plant No. 2. The nitrate plant was found in excellent standby condition.

The next meeting of the society will be held at Chicago next April with a symposium on the industrial uses of chlorine.

Federal Power Board Against Both Wynooche Plans

The Federal Power Commission has rejected both the application of the city of Aberdeen and that of the Gray's Harbor Railway & Light Company for rights on the Wynooche River, in the State of Washington, on the ground that neither applicant has the requisite state rights and in addition on account of the lack of public necessity for the development. Thirty days have been allowed during which the applicants may file an appeal. The rivalry between the city and the central-station company for this site and the resulting litigation have been followed in these columns. (See issue for September 12, page 531.)

The Mount Shasta Power Corporation pursuant to its preliminary permit of May 5, 1923, has applied for a license covering Pit No. 4 site on Pit River, near Redding, Cal. The power is to be sold to the Pacific Gas & Electric Company. The development will make available 56,880 hp. of primary power, and it is proposed to install three 40,000-hp. generators.

James B. Knight of El Paso, Tex., and others have applied to the commission for a preliminary permit covering a project on New River in the Trinity National Forest in Colorado. It is proposed to erect a diversion dam 50 ft. high. The water is to be carried to the power house 12 miles distant through a ditch and a conduit. About 5,000 hp. of primary power will be made available for the operation of sawmills.

French Lick Convention Has Wide Appeal

Precedence Over Technical Problems Given to Handling Human Relations by Great Lakes N. E. L. A.—Business Building, Operating and Finance Leading Topics

THREE half-day sessions crowded with papers on vital and timely utility problems and activities made the convention of the Great Lakes Division of the N. E. L. A. at French Lick Springs, Ind., last week of great profit to the delegates, nearly seven hundred in number, who attended it, and plenty of recreation added to its benefit and pleasure. Outstanding among the individual addresses were those by M. S. Sloan of the Brooklyn Edison Company and J. F. Gilchrist of the Commonwealth Edison. Mr. Sloan's keynote was "doing more than the law requires," and Mr. Gilchrist discussed pressing problems and opportunities of utilities. A paper by H. V. Bozell of Bonbright & Company, New York, on present and future financing also struck a responsive chord.

Wide Range of Topics

National association viewpoints were expressed at the Thursday night banquet by President J. E. Davidson, Managing Director M. H. Aylesworth and the director of engineering, Colonel William Kelly. Rural service was not forgotten. Other subjects discussed in detail were political ownership propaganda, difficulties of comparing municipal and private utility accomplishments, budgeting expenses, Diesel engine costs, system operation, developing, lighting business, selling electric transportation, inductive co-ordination, voltage regulation and security sales accounting. Eleven women employed by utility companies discussed contact with universities, women's club activities, personal service, employee relations, "safety first" and national activities.

President B. F. Lyons in addressing the opening session urged the organization of more home-service departments to follow up the sale of appliances, more co-ordination between state and local public utility information bureaus in the same division and the inauguration by the national body of prize-essay contests among the public regarding the value of holding companies. He also urged utilities to start within their organization in seeking better human relations, to evince a sincere desire to solve the radio interference problem and to work jointly for the application of credit rating to workmen's compensation risks.

Four major topics were discussed by John F. Gilchrist, namely, building load factors, the temptation to relax ideals of service in pursuit of inordinate gains, the reduction of costs consistently with service and resources, and human relations within a utility organization. M. S. Sloan said that utilities are not warranted in pinning medals on themselves for doing what the law requires. Good will must be acquired through doing more than the law requires. First, deserve good opinion, then develop friends by being friendly first, always and consistently, he advocated. The spirit of service is as important as the service. Increasing stability of utilities and the respect which comes from length of service may make it possible for utility companies to obtain better terms on borrowed money in the future, prophesied H. V. Bozell. He called particular attention to the need to balance security issues, to build financial structures to serve as a foundation for huge future funds and to study and analyze requirements for longer periods ahead. Human relations, both inside and outside the organization, were discussed in papers by H. T. East, A. B. Gates, A. K. Hurlburt, Ray Warren, Charles W. Bradley and a number of the women delegates.

R. F. Schuchardt remarked that while the "giant power" report issued in Pennsylvania contains much valuable information, the social zeal of some of the contributors to it is apparently greater than their economic knowledge. The effect of such reports must be counteracted by presentation of facts and exposure of fallacies. This will be done in the report of the Great Lakes power survey, which will be available at the end of the year.

Inductive Co-ordination

More progress has not been made in inductive co-ordination, Colonel William Kelly said, because utility companies have not been able to agree on the division of costs and the standardization of methods. There is need, he declared, of setting up some form of representation of all electric power utilities by which unity of purpose can be expressed and results obtained with less work. J. C. Martin, speaking on the same topic, pointed out that the problem has expanded to include radio interference and train control.

Rural service was discussed from different angles by Eugene Holcomb, G. C. Neff, Lillian Minch, F. E. Andrews, Prof. G. T. Christie and Mr. Hendricks of the Illinois Commerce Commission. Mr. Holcomb urged that electric light and power companies establish separate

rural service departments. He favored a fixed charge plus a low energy rate. Professor Christie contended that the solution of the rural service problem is not in cheap lines but in good lines giving reliable service and large usage. To avoid the expensive revamping of lines later he urged a systematic layout of farm lines now. He expressed the belief that rural electric service will do even more for the farmer than the automobile and can be sold on a similar economic basis.

The budget as an aid to utility administration was discussed by G. L. Stansburg and C. A. Keller.

C. H. Purdy, G. R. Mitten and J. S. McMillan presented data collected to afford a basis for selling purchased power in competition with Diesel engines. They emphasized the fact that sufficient reliable data on Diesel engines are not available. Maintenance, repair and lubricating expenses are not carefully recorded; fixed charges, depreciation, taxes and insurance are overlooked or not directly charged, and little information is available on operating reliability.

System operation was discussed by A. C. Steck and F. J. Cunningham and carrier-current telephony as an aid to load dispatching by John Ferguson. C. C. Jackson then answered questions on carrier current and admitted that at the present time complete breaks in transmission lines are liable to interrupt communication, that the method has not been successful so far on cable circuits and that multiplexing has not been practically applied, although there are prospects of doing so.

LIGHTING IN SMALL TOWNS

Promotion of commercial and industrial lighting in small towns was discussed by F. W. Mayo, M. R. Rodgers and R. Bridges, who considered organization, methods of obtaining business, advertising campaigns, analysis of field and outlook for development. The plan of the national industrial lighting campaign was outlined by J. F. Becker, who explained that it is different from the home-lighting campaign in that it includes a follow-up plan.

E. A. Armstrong said that last year was the best yet experienced in the extension of electric transportation in the Great Lakes territory. Development expense is justified, he declared, because whole fleets follow the introduction of the first one or two trucks. A rate less than 3 cents is justified because of the excellent load factor.

How to get the best results from voltage-regulating equipment was discussed by Charles R. Schuler, W. E. Gundlach and F. L. Reinman. Mr. Gundlach said that his company concentrates the load on regulators and balances it in the districts. Periodic graphic voltage readings at all load centers are employed by both Mr. Gundlach and Mr. Reinman.

Committee reports covered, in addition to subjects already mentioned, insurance, technical activities, wiring, metering practices, prime movers and accident prevention. At least two of the committees deprecated what they considered the half-hearted support from some of the central-station companies.

Colorado River Dispute

Washington Deprecates Attitude of Upper Basin States as Well as That of Arizona

(From Our Washington Correspondent)

MUCH criticism of the states of the upper Colorado River basin—Colorado, Wyoming and Utah—is heard in official quarters in Washington because of the formal action taken by them at a recent meeting of officials in opposition to the extension of any rights on the Colorado River until the seven-state compact has been made effective. There has been little sympathy in Washington with the attitude of Arizona in refusing to sign the compact, but the feeling is that there is even less to be said in justification of this action of the upper states.

This step was taken, all feel sure, to influence the decision of the Federal Power Commission, which will meet October 20 to pass upon the Girand license covering the important development at Diamond Creek which is to be the source of power for the Arizona copper mines. The license covering this project has been withheld for nearly three years, when, many contend, the commission really was under moral obligations to issue it, with the sole idea of being abundantly generous to the upper states and with the idea of giving them further opportunity to present valid reasons why the license should not be issued.

The feeling is that the upper valley states simply are trying to use the departments in Washington to take action which will relieve these states from the consequences of the decision of the Supreme Court in the Colorado-Wyoming suit. This decision held that the doctrine of prior appropriation of water does not stop at the state boundary. Ever since that decision was handed down the upper states have been trying to escape its consequences. The proper way to avoid them, nearly every one thinks, is to enter into an agreement as to the disposition of the waters of the river. Another way that the consequences may be avoided is to hold up all development until some agreement is forced. This latter alternative is not justified, most authorities agree, particularly when there is enough water for every one, and in this instance the Colorado River compact particularly is being made a part of Mr. Girand's license.

One of the conditions of any license that may be issued to Mr. Girand is that his right to use water shall be forever junior to the right to use water above him for irrigation or domestic purposes, regardless of the date of the initiation of rights or of use, but it is contended in the upper states that such conditions cannot be made legal or binding. There is no justification for such a conclusion, it is argued in Washington. If the use of the water in the upper basin did in fact deplete the amount to which Girand otherwise would be entitled under his Arizona appropriation and he should undertake to prevent any depletion regardless of the limitation in his license, his only recourse would be in courts of Colorado or other upper basin states. The moment he should go into a court of equity and attempt to take out an injunction against the cause of the depletion, he would be met with the terms of his license, the acceptance of which gave him his only rights. Under such conditions, it is asserted, he would have no standing in any court of equity when his only occasion for being there was a violation of an agreement.

A.E.R.A. Convenes at Atlantic City Next Week

A record-breaking attendance is officially predicted for the annual convention of the American Electric Railway Association, to be held at Atlantic City next week, with concurrent sessions of the Engineering Association, the Accountants' Association, the Transportation and Traffic Association, the Claims Association and the parent body. To non-railway men the most interesting session will probably be that of the Engineering Association on Thursday afternoon, when the reports of the committees on power transmission and distribution, power generation and conversion, automatic substations and codification of power failures will be discussed. A paper on the Schaefer method of resuscitation, by Dr. Hart E. Fisher, Chicago, and committee reports on engineering symbols and on wood preservation are among the other items of general interest.

Buys Consumers' Light & Power of New Orleans

A controlling interest in the Consumers' Light & Power Company of New Orleans, operating chiefly in the commercial district of that city and one of the heaviest purchasers of light and power from the New Orleans Public Service, Inc., has been acquired by C. A. Tessier, Jr., and associates, owners of the Citizens' Light & Power Company, with domicile in Carrollton, in the upper residential section of New Orleans. The purpose of the purchase is to effect a consolidation of the two companies with the view of actively entering this field for the distribution of light and power.

The Citizens' Light & Power Company received permission from the Commission Council recently to change from a service-charge basis, under which it was said to be operated at a loss, to the level of the rates of the New Orleans Public Service, Inc., with the same rate of return. Mr. Tessier declined to discuss the rumor that the consolidation of the two companies portended competition between them and the New Orleans Public Service, Inc.

Central Maine Power Company Erecting Hydro Plant

Construction has begun on a 27,000-kw. hydro-electric plant for the Central Maine Power Company at Gulf Island on the Androscoggin River, 5 miles above Lewiston. The development includes a concrete dam 55 ft. in height. The dam and power house will be built by the Morton C. Tuttle Company, Boston, and completed by 1927.

Keeping Step with Florida's Growth

By Construction and Interconnection Power Companies Meet Increasing Demands for Service—120-Mile Coast Line Under Way from Miami North

THE boom in Florida real estate that has attracted so much attention in the last year or two has been accompanied by a vigorous development of the electric light and power companies of the state. There has, however, been nothing sensational about this development. It has taken place along sane and practical lines which, while meeting all present demands for electric service and making provision for increases in the future, do not involve investments in equipment that might prove far beyond the need of the territory served.

Until the beginning of the present development virtually all the towns were served by local plants which varied widely in size and efficiency. Fuel oil was and is the most widely used fuel as it can be transported by water from the Gulf Coast fields to points within a comparatively short distance of most of the power stations. When large companies entered the Florida field their activity was, as it still is, concentrated on the elimination of the smaller and inefficient plants by interconnection with larger ones and the modernization of plants which were scheduled to furnish power for the transmission-line systems as soon as these were completed. Not only are gross earnings showing a large increase, but net earnings show even larger growth, due to economies from more modern operation.

The different systems are being interconnected in the way shown in the accompanying map, which shows the four large systems that, with one or two exceptions, serve all the important cities and towns in the state. Jacksonville, near the northeast border, which is Florida's largest city, depends, however, on its municipal plant. Key West, in the extreme south, is taken care of by the Key West Electric Company, under Stone & Webster control, and Pensacola, in the northwest corner, is served by the Pensacola Electric Company, now controlled by the Southeastern Power & Light Company. Purchase by a real estate company, reported to be a subsidiary of the Alabama Power Company, of a large site near the Chipola River has given rise to a belief that a hydro-electric plant in that stream may eventually be added to power sources in the northwestern end of the state.

PINELLAS COUNTY AND TAMPA SYSTEMS

The Pinellas County Power Company, with its subsidiary the Florida Power Company, and the Tampa Electric Company serve the area along the west coast extending north and east from Tampa and St. Petersburg. The first two companies are among the properties of the National Public Service Company, and the Tampa company is operated by Stone & Webster, Inc. A 66-kv. transmission line of 10,000 kva. transmitting capacity is now being built to interconnect these two systems. Each of them has a modern generating station—at St. Petersburg and Tampa respectively—whose power will in this way be made available through the entire territory. The Pinellas County Power Company's new steam plant at St. Petersburg is rated at 6,000 kva., more than doubling the former capacity there, and Stone & Webster have added a 10,000-kva. unit to the Tampa plant, where there were previously a 14,000-kw. steam turbine and a 1,400-hp. hydro-electric plant.

EXISTING, PARTY BUILT AND PROPOSED TRANSMISSION LINES IN FLORIDA

The Florida Public Service Company, controlled by the General Gas & Electric Company, is building a transmission system over 133 miles in length serving the central part of the state. It has cut the number of generating stations in operation to four, at De Land, Orlando, Eustis and Lake Wales, with corresponding economy in generation, and plans to meet further demands of the immediate future through interconnections now being completed with the Pinellas County Power Company at Leesburg and with the Tampa Electric Company at Winterhaven. It is also considered possible that connection will eventually be made on the east with the system of one of the subsidiaries of the American Power & Light Company, though no plans have been made for this.

AMERICAN POWER & LIGHT SYSTEM

The American Power & Light Company in 1924 acquired the Southern Utilities Company, which serves among other cities St. Augustine and Palatka in the north and Bradenton, Fort Myers, Arcadia, Okeechobee, Stuart, Palm Beach and West Palm Beach in the south. Its other subsidiaries include the Miami Electric Light & Power Company and the Daytona Public Service Company. A 12,500-kw. unit has been added to the existing Miami plant, and another unit of 15,000 kw. rating, now under construction, will be ready early next year. At Miami Beach a plant with an initial rating of 5,000 kw. has been built.

A new high-pressure, oil-burning plant with an ultimate rating of 100,000 kw. or more is to be built at Sanford by a subsidiary of the American Power & Light Company. A site on the St. John River has been chosen, and construction will begin at once. The first unit of 10,000 kw. will, the company plans, be ready to operate late in 1926. This plant will carry much of the total interconnected load in north-

ern Florida, and when the first unit is ready several small and inefficient plants now in service will be closed.

The American Power & Light Company has in view the eventual interconnection of its Florida properties in much the same manner that the Texas properties controlled by it have been connected. Already it has under way a 120-mile, 66-kv. transmission line extending north along the Atlantic coast from Miami to Stuart which will tie together all its southern Florida plants on the east coast. This line, it is expected, will be finished late in 1925 or early in 1926. Shorter additional interconnections of properties are also under way or in immediate contemplation. But the company is little likely to stop here. Eventually its lines will extend all the way to St. Augustine, traversing virtually the entire Atlantic coastline. The connection of the plants on the west coast of the state is also contemplated, the first step to be a line from Fort Myers to Bradenton, serving several intermediate towns.

In building their transmission lines all the large companies now in the Florida territory have so designed them that their voltage and capacity may be increased largely with very little additional expense. Much of the new investment to date has been in rebuilding and expanding distribution systems and substation equipment to be ready for increases in load.

Briefer News

Iowa Company Buys Texas Plants.—Purchase of Texas public utility properties at cost of more than $300,000 has been announced by the Central States Power & Light Corporation, a Davenport (Iowa) company. Towns which will now look to this company for their electric service are Floresville, Burnet, Bertram, Round Rock, Hutto, Buda, Kyle, Stockdale and Flugerville, with a total population in excess of 20,000.

Idaho Falls Taxpayers Against Extending Municipal Plant.—A temporary injunction has been issued at the instance of taxpayers, restraining the city of Idaho Falls, Idaho, from purchasing a Diesel engine as an auxiliary unit to the municipal power plant. The action is based on the ground that the estimated total cost of $92,000 is more than the city officials can pay under the constitution of the state.

Ferraris Commemorated in Italy.—As a tribute to the memory of Galileo Ferraris, the municipal authorities of Livorno Vercellese, the native place of the eminent scientist, have recently changed the name of the little town to Livorno Ferraris. The event was made the occasion of a ceremony, electrical engineers from all parts of Italy being present. A message was received from Edison. The house in which Ferraris was born in 1847 has also been acquired by the local authorities and is to be converted into a museum.

Appalachian Power Company Acquires Another Virginia Plant.—The Appalachian Power Company of Bluefield, W. Va., has purchased the plant of the Rocky Mount (Va.) Light & Power Company for $50,000. A new and larger generator is to be installed. It is expected that in two years a transmission line from Roanoke to Martinsville, Va., will pass through Rocky Mount. The local plant will be operated in the meantime and later held as a reserve unit.

Ellensburg, Wash., May Sell Municipal Plant.—An offer of $275,000 for the municipal light and power plant of the city of Ellensburg, Wash., has been made by the Puget Sound Power & Light Company and is under consideration by the city. If it is rejected, an expenditure of $100,000 for an addition to the plant is contemplated.

Large Project for Olympic Peninsula.—Plans for a combined irrigation and hydro-electric project on the Olympic peninsula have been laid before the Washington State authorities by the Commissioners of Jefferson County, who have filed as individuals for water rights on the Quilcene and Little Quilcene Rivers. The project, as outlined, would cost $8,000,000 and provide for two hydro-electric plants besides irrigating 60,000 acres of land and supplying Port Townsend with both power and water for public and industrial service.

Frederick (Okla.) District Meeting a Success.—The best district meeting yet held by the Electrical Division of the Oklahoma Utilities Association took place at Frederick on September 16, with an attendance of fifty. Morning and afternoon sessions were held, and a noonday luncheon was addressed by S. I. McElhoes, Oklahoma City, general attorney of the Southwestern Light & Power Company. W. D. Riggs, manager of the Oklahoma Gas & Electric Company at Elk City, was elected district chairman. Lawton was selected as the meeting place next year.

Paper-Manufacturing Company Takes Over Kaministiquia Plant in Western Ontario.—The sale of the Kaministiquia Power Company, Ltd., of Fort William, Ontario, to the Fort William Paper Company is announced in a letter to the shareholders of the former company over the signature of Sir Herbert Holt of Montreal, president. The Kaministiquia Power Company has a 35,000-hp. hydro-electric plant at Kakabeka Falls and also purchases energy from the Hydro-Electric Power Commission of Ontario.

Marshall, Tex., and Shreveport, La., to Be Linked.—The East Texas Public Service Company, an operating subsidiary of the American Public Service Company, has purchased the Waskom Light & Power Company at Waskom, Tex. Through the purchase of this utility a connecting link is formed between the East Texas Public Service Company at Marshall, Tex., and the Southwestern Gas & Electric Company at Shreveport, La. This interconnection is in line with the plans of the Central & South West Utilities Company, recently formed by the Insull interests as an investment company.

Memphis Company Has New Office Building.—The Memphis Power & Light Company has moved into its new office structure at Madison and South Third Streets, a six-story white stone building, with entrances on both streets. Many windows are used for electrical displays at night.

Canadian Exports of Electrical Energy.—The total amount of electrical energy exported from Canada during the first four months of the present fiscal year, ended July, according to the report of the Dominion Bureau of Statistics, was 441,614,584 kw.-hr., as compared with 428,233,006 kw.-hr. during the corresponding period in 1924. The export of electrical energy during the month of July this year totaled 112,737,228 kw.-hr., as against 104,952,941 kw.-hr. in July, 1924.

Industrial and Governmental Competition for Hydro Site on Winnipeg River.—The Backus-Seaman pulp and paper interests have made application to the Canadian government for the lease of the Seven Sisters power site on the Winnipeg River, in the Province of Manitoba, but the government has refused to grant the request until the Manitoba government approves the project. Considerable opposition to the lease of this site has arisen in Winnipeg on the ground that the Seven Sisters Falls are expected to furnish additional electric power in the near future for provincial and civic hydro enterprises.

Wisconsin Power & Light Wins Disputed Territory. — The Wisconsin-Northern Light, Heat & Power Company has been denied permission to construct a transmission line to serve the towns of Bloomfield, Saxville, Leo, Warren, Aurora, Wolf River and Poy Sippi, following strenuous objection from the Wisconsin Power & Light Company, which, the Railroad Commission found, served or had rights in the territory involved. The town of Wolf River recently granted the Wisconsin-Northern company a franchise to construct a hydro-electric power plant, work on which is now under way.

Southern Cities Utilities Adds Another Property.—The Southern Cities Utilities Company, holding company for the Southern Cities Power Company of Chattanooga, Tenn., has purchased the Sequatchie Light & Power Company, operating in the towns of Hohenwald and Petersburg. The purchase provides a connecting link between the eastern section of the state at Rockwood and the company's main transmission lines at Tracy City. The company's lines now cover the southwestern part of Tennessee as far west as the Tennessee River and extend into Alabama.

To Push Farm Electrification in Oklahoma.—A definite step toward establishment of one or more experimental farm lines in Oklahoma was taken last week at a meeting of the farm electrification committee of the Oklahoma Utilities Association, when a sub-committee composed of Edwin Kurtz, pro-

fessor of electrical engineering, Oklahoma Agricultural and Mechanical College, as chairman; P. J. Hayes, manager Oklahoma Power Company, Hugo, and O. A. Jennings, manager commercial department Oklahoma Gas & Electric Company, was appointed by E. F. McKay, who acted as chairman of the meeting, to make a survey and recommendations as to proper location of one or more of these lines.

New "White Way" in Salt Lake City.—Salt Lake City's newest "white way" lighting system, on First South Street, covering two blocks between State and West Temple Streets, was placed in operation on the night of September 16, thousands of citizens taking part in a carnival arranged for the occasion. The new lighting system consists of twenty-eight standards (seven to the block on each side of the street), each with three General Electric inverted 1,500-cp. luminous-arc lamps. The standards, which are 25 ft. in height to the top lamp, are Union Metal Manufacturing Company pressed steel with cast-iron bracket base. This installation completes the third unit in the making of Salt Lake City's business district "the best lighted in the world."

Outdoor School for Electric Commercial Men in Nebraska Succeeds.—Forty-seven men were enrolled at Camp Service near Grand Island, Neb., for the camp held September 18, 19 and 20, under the direction of Chairman SeChevrell and the commercial committee of the Nebraska Section of the National Electric Light Association. The camp was held on the banks of the Platte River on a wooded tract belonging to the Central Power Company, upon which stands a new steam power station, 4 miles from the city. President Davidson of the N. E. L. A. opened the meeting. Especial attention was given to showing how sales of appliances, and consequent sales of energy, can be encouraged in small towns; how the electric business can be profitably advertised and with what results; how peak loads can be leveled into the valleys, and how good service and courteous treatment of customers can bring abiding and satisfactory public relations. Salesmanship schools were conducted.

Los Angeles Will Begin Building Nine Substations.—Work on nine of the twelve new substations to be built for the Los Angeles Bureau of Power and Light is to begin at once. The largest of this group will be at Ninth and Mateo Streets. It will have an installed capacity of 65,000 hp. and will replace the two smaller substations now being operated to capacity in that district. The building is to be of reinforced concrete throughout and will cost approximately $400,000. Other substations, to cost $75,000 each, are to be of steel-frame construction. These stations will be built at Longwood Avenue and San Vicente Boulevard, Missouri Avenue and 102d Street (Sawtelle), Menlo Avenue and Ninety-first Street, Sixth Street and Eleventh Avenue, Clinton and Hoover Streets, and one in Lankershim, one in Reseda and one in Owensmouth.

North Central N. E. L. A. Men Get Together at Grand Forks, N. D.—Another district meeting of electrical men, this time from northwest Minnesota and northeast North Dakota, was held by the North Central Electric Association on September 17 in the Hotel Dacotah, Grand Forks, under the auspices of the Red River Power Company, forty-five men and women being in attendance. State Senator Walter Schlosser, Grand Forks, who is interested in the Electric Construction Company, welcomed the visitors, and T. D. Croker, assistant general manager Northern States Power Company, outlined the accomplishments of the National Electric Light Association and spoke briefly on the advantages of electrical refrigeration as a load builder. Commercial topics took up a great deal of the round-table discussions, although transmission problems and rural electrification problems also received attention. The next meeting will be in Fergus Falls, Minn., on or about October 19. The Otter Tail Power Company will be the host.

Another Big Texas Plant Projected.—Engineers of the Texas Power & Light Company of Dallas are preparing plans for a 75,000-kw. steam plant at Bastrop, Tex., according to an announcement by W. B. Head, chairman board of directors. Mr. Head, who estimates the cost of the plant at $8,000,000 to $10,000,000, says it will be built near a great deposit of lignite, which will be burned in powdered form. The plant will be a close duplication of the one now being built at Trinidad in northern Texas by the same company. The Texas Power & Light Company recently entered into a five years' contract with the San Antonio Public Service Company for the purchase of power. The new plant at Bastrop is to be completed on or before the expiration of that contract, according to Mr. Head. It will be linked with the transmission line that is to run from San Antonio to New Braunfels. The system has recently been extended southeast to Smithville and Brenham and may eventually extend to Houston.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, July 4, page 50.]

American Electric Railway Association—Atlantic City, N. J., Oct. 5-9. J. W. Welsh, 292 Madison Ave., New York.

National Association of Railroad and Utilities Commissioners — Washington, D. C., Oct. 13-16. J. B. Walker, 270 Madison Ave., New York.

Electric Power Club—Briarcliff Manor, N. Y., Oct. 19-22. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

Association of Edison Illuminating Companies — New Arlington Hotel, Hot Springs, Ark., Oct. 19-23. Preston S. Millar, 80th St. and East End Ave., New York.

Association of Railway Electrical Engineers—Hotel Sherman, Chicago, Oct. 20-24. J. A. Andreucetti, 413 C. & N. W. Terminal Station, Chicago.

American Welding Society—Boston, Oct. 21-23. M. M. Kelly, 29 West 39th St., New York.

Kansas Public Service Association—Topeka, Oct. 22-23. H. Lee Jones, Topeka, Kan.

Iowa State Association of Electrical Contractors and Dealers—Waterloo, Iowa, Oct. 27.

Southeastern Geographic Division, N. E. L. A.—Chattanooga, Tenn., Oct. 29-30. E. T. O'Connell, Alabama Power Co., Birmingham.

American Engineering Council — Administrative Board, Columbus, Ohio, Oct. 29-30. L. W. Wallace, 26 Jackson Place, Washington, D. D.

Public Utilities Association of West Virginia—Kanawha Hotel, Charleston, W. Va., Oct. 30-31. A. Bliss McCrum, 514 Charleston National Bank Bldg., Charleston, W. Va.

Associated Manufacturers of Electrical Supplies—New York, Nov. 9-13. F. Nicholas, 30 East 42d St., New York.

Northern New York Utilities Aids Reforestation.—Among commercial organizations aiding annually in the work of reforestation in New York State is the Northern New York Utilities, Inc., of Watertown, which this fall will set out 180,000 red-pine seedlings and 250,000 Norway spruce transplants. In addition to displaying public spirit, two direct benefits will in this way be achieved by the company. The reforestation made at stragetic points in the foothills of the Adirondacks on its western watershed will act as a barrier to the snow and assist in the general scheme of the work of the Black River Regulating District, out of which regulation of flow the Northern New York Utilities, Inc., is through power development a direct beneficiary. In years to come the paper-mill industry of the section in which the company holds interlocking interests will receive the benefit of a supply of pulp wood within short water haul of the various paper-making plants in the Black River watershed.

Various Electric Properties in Ohio Change Ownership.—The Ohio Gas & Electric Company of Middletown has been authorized to sell to the Union Gas & Electric Company of Cincinnati its electric distribution system in southwestern Ohio. Authority to sell to the Suburban Power Company the electric light properties situated in and about the villages of Bristolville, North Bristol, Bloomfield, Louisville, Harrisburg and Middlebranch, Ohio, has been given the General Light & Power Company. The consideration is to be $136,000. The Western Reserve Power Company has been authorized to buy from the Cleveland Southwestern Railway & Light Company high-tension lines, distribution lines and equipment serving the villages of Nova, West Salem, Sullivan and Spencer, Ohio, for the sum of $45,000. The company also has been authorized to purchase from the East Ohio Power & Light Company property in and about the village of Medina for the sum of $200,000. The Cleveland Electric Illuminating Company has offered $33,000 for the municipal light plant of Chardon, Ohio. If the offer is accepted, Chardon residents will get electricity for about one-half the price it now costs them on the same terms by which the company serves forty-five cities and villages. The company recently purchased two smaller plants.

Men of the Industry

P. J. Morrissey Heads Pennsylvania Association

P. J. Morrissey, who has been elected president of the Pennsylvania Electric Association, as announced in a recent number of the ELECTRICAL WORLD, has been affiliated with the light and power industry in Johnstown, Pa., since 1911, when he became general manager of the Citizens' Light, Heat & Power Company of Pennsylvania. In 1919 that utility and several affiliated companies were merged to form the Penn Public Service Corporation and Mr. Morrissey became vice-president, the position he occupies at the present time.

Born at Franklin, Pa., in 1876, Mr. Morrissey attended Pennsylvania State College and was graduated from that institution in electrical engineering in 1904. From 1904 to 1911 he was in the employ of the Detroit Edison Com-

P. J. MORRISSEY

pany, first as assistant chief engineer at the Delray station and later as mechanical engineer. Mr. Morrissey has been active in the affairs of the Pennsylvania Electric Association, having served as treasurer in 1923-24, first vice-president 1924-25 and as a member of the executive committee for the past six years.

A. G. Loney, for the past twelve years line superintendent for the Pennsylvania-Ohio Electric Company in the Shenango Valley and New Castle, Pa., district, has resigned. Mr. Loney has announced no definite plans for the future.

Arthur W. Park, until recently manager of the publicity department of the Buffalo General Electric Company, has resigned to affiliate himself in a similar capacity with the Illinois Light & Power Company, with headquarters in Chicago.

C. M. Brewer, vice-president and general manager of the Mountain States Power Company, has been appointed to that position with the Tacoma Gas & Fuel Company to succeed D. J. Young, who had managed the Tacoma property for some years. Mr. Brewer's headquarters will be in Tacoma, whither the general offices of the Mountain States company have been moved from Albany, Ore. Mr. Young will remain with the Byllesby Engineering & Management Corporation in a consulting capacity.

Edwin Kurtz, assistant professor of electrical engineering at the Iowa State College, Ames, has severed his connection with that institution to become head of the department of electrical engineering of the Oklahoma Agricultural & Mechanical College, Stillwater, Okla.

E. Thomann, managing director of Brown, Boveri & Company's railway department, and **A. Buchli**, executive director of the Swiss Locomotive Works, arrived in New York September 29 aboard the White Star liner *Majestic* for a short stay in this country. During their visit they will inspect the plant of the New York Shipbuilding Corporation, Camden, N. J., which is to be utilized by the American Brown-Boveri Electric Corporation for the manufacture of electrical equipment.

W. L. Douglass, formerly electrical distribution superintendent of the Wisconsin Valley Electric Company's properties, has been appointed district manager by the Monongahela West Penn Public Service Company to take charge of the Clarksburg (Va.) district.

Richard Boonstra has been appointed agricultural engineer for the Public Service Company of Northern Illinois, Chicago. Prior to a year's service in utility work Mr. Boonstra conducted service schools throughout the State of Michigan for the J. I. Case Threshing Machine Company. Mr. Boonstra was graduated in mechanical engineering from the Michigan State College of Agriculture and Applied Science.

Benjamin F. De Lanty has been appointed general manager of the Municipal Light and Power Department of Pasadena, Cal., to succeed former City Manager C. W. Koiner, who also served as head of the city light and power utility. When Mr. Koiner resigned a short time ago Mr. De Lanty was made acting general manager.

A. J. Merkle, who has been connected with the Southwest Power Company, McAlester, Okla., for more than a year, has been transferred to the Emporia division of the Kansas Electric Power Company.

J. I. Mange, president of the Associated Gas & Electric Company, was elected president of the Pennsylvania Electric Corporation at a meeting of the board incident to the taking over of the management of the corporation by the Associated organization. **H. C. Hopson**, vice-president and treasurer of the Associated, was elected to the same office in the Pennsylvania Electric Corporation, and **Warren Partridge** and **John M. Daly** were made vice-presidents. **M. C. O'Keeffe**, secretary of the Associated, was elected secretary of the Pensylvannia Corporation.

E. B. Neiswanger General Manager of Central Power & Light

E. B. Neiswanger has been elected vice-president and general manager of the Central Power & Light Company, which was acquired early this summer by the Middle West Utilities Company. In his new office he will be in charge of the construction work and operation of the subsidiary companies. Mr. Neiswanger has long been identified with the electrical industry in the Southwest and has been a prominent member of its representative associations.

A native of Burton City, Ohio, he first was engaged on the construction of the pioneer steam-turbine plant and the electrification of the B. F. Goodrich Rubber Company's plant at Akron. Following an association with the United States Reduction & Refining Company and the United States Sugar & Land Company in 1913, he was appointed construction superintendent of the Texas Power & Light Company and affiliated companies, advancing one year later to the position of chief engineer. He then joined the Phoenix Construc-

E. B. NEISWANGER

tion Company and subsequently became vice-president and general manager of the Texas Construction Company. From 1921-1922 he was connected with the Texas lignite industry, and from 1922-1923 he engaged in consulting engineering work in Dallas. During the past three years he has served as district manager and engineer in charge of the development work in the Rio Grande Valley for the Central Power & Light Company and as consulting engineer on the properties operated by Messrs. Morrison and McCall of St. Louis.

E. A. Reilly, K. C., minister without portfolio in the New Brunswick government, has been appointed chairman of the New Brunswick Electric Power Commission.

Milton Lothrop, Jr., has been made superintendent of plants of the East Texas Public Service Company, according to an announcement made by James E. Kennedy, president of the company.

C. H. Smoke, formerly of the engineering department of the Mississippi River Power Company, Keokuk, Iowa, has been transferred to the engineering department of the Western United Gas & Electric Company, Aurora, Ill.

Commission Rulings

Electric Company Not Required to Serve Unsafe Private Line.—The Public Service Commission of Pennsylvania ordered the Moscow Electric Company to furnish electricity to the complaining owner of a private distribution line, but only on condition that this owner, to whom service had been refused because his line was unsafe, place the line in a reasonably safe condition for the transmission of electricity. A service meter was ordered installed at a point where the private line joined with the lines of the company and not at the house of the owner.

Municipality Allowed to Purchase Lighting Plant Without Establishing Financial Strength.—The Public Service Commission of Pennsylvania has allowed the Borough of Rockwood to acquire and operate the plant of the Rockwood Electric Company, even though the purchase may necessitate the postponement by the borough of other contemplated improvements. The commission's approval was given despite the fact that the borrowing capacity of the borough was not clearly shown to be sufficient to permit the purchase, since the commission does not fix the price to be paid or finally determine the borrowing capacity. Whether or not the borough had the power to take the property adversely by condemnation proceedings under authority granted by the provisions of the Borough Code was not decided.

Fair Return and "the Massachusetts Rule."—In adjudicating a complaint brought by the city of Boston against the New England Telephone & Telegraph Company, the Massachusetts Department of Public Utilities discussed "the federal rule" and "the Massachusetts rule" of fair return, saying: "This commonwealth has been the pioneer in the regulation of public utilities. It has controlled the issue of securities and their price for decades and, as a consequence, has proceeded upon the theory that these securities thus issued constitute the proper base. Stated tersely, it is the money honesty and prudently invested and devoted to the public service that is entitled to a fair return. This doctrine grew out of the general practice obtaining in Massachusetts in such matters and in its fundamental thesis conforms to economic necessities and is based upon the actual facts as opposed to doctrinaire theories. No evidence was presented that the company's outstanding securities do not now represent property of their face value or that the company is not entitled to earn a fair return upon its outside securities and the par value of its capital stock, or, to put it in practical terms, to earn enough thereon to keep the price of its stock above par. . . . Viewed from either the federal or the so-called Massachusetts theory, an amount of revenue sufficient to meet the operating expenses and fixed charges of the company, provide a reasonable reserve for depreciation and insure the payment of reasonable dividends that will readily attract new capital necessary for the proper development of the company will, in our judgment, yield a fair return either upon the fair value of the property devoted to the public welfare or upon the investment of the stockholders. This amount of revenue the company stated was all that it desired and thus it has waived everything more."

Distinguishing Between Urban and Rural Customers — Refunds to Customers Who Finance Extensions.—An extension to a consumer located just outside of village limits is not a rural extension, said the Wisconsin Railroad Commission in drawing up rural service rules for the Willow River Power Company, if the transformers furnishing the service are located inside the village limits and the only parts of the distribution system extending beyond the village limits are the service wires to the consumer's premises. The owner of a gasoline filling station within village limits is entitled to an electric connection without cost when the main circuit feeding the village proper passes directly by his place of business. A rule providing for extensions over a certain distance at the expense of the consumer is unfair, the commission further held, when no provision is made for refunds to the original customer or customers who finance the line when additional customers are taken on.

Recent Court Decisions

Commission's Power to Alter Rates.—Pointing out that rates established by legislative authority create no vested rights and may be changed from time to time at the discretion of the body possessing such legislative power, the Supreme Court of Minnesota *in re* Northwestern Bell Telephone Company also decreed that the statute placing telephone companies under the supervision of the Railroad and Warehouse Commission gives the commission power to fix reasonable rates for particular localities without making a state-wide rate adjustment. (204 N. W. 873.)*

Power Company May Acquire Additional Transmission Right-of-Way Contiguous to Existing Line. — In Jasper Land Company vs. Alabama Power Company the Supreme Court of Alabama held that the power of eminent domain was necessary for the public good, that the landowner was guaranteed adequate compensation by law, and therefore that the power company was entitled to acquire as many transmission-line rights-of-way as could be shown necessary for the public service. The land company contended that the power of condemnation as regards any one tract of land was exhausted by the acquisition of one right-of-way, but the court held that, since electricity is generated at one point and transmitted over a large area, the company was entitled to acquire as many rights-of-way as were necessary to give service. (105 So. 264.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

State Supreme Court Refuses to Review Interlocutory Court Orders Denying Petition of Commission Against Decree.—The Alabama Power Company appealed from an order of the Public Service Commission reducing certain rates but was refused a rehearing by that body. The company then petitioned the courts to order a rehearing and the commission unsuccessfully contested this application. The Alabama Supreme Court ruled that the company's appeal dated from the commission's refusal of a rehearing and not from the issuing of the original order reducing rates and was therefore within the period of thirty days prescribed by statute. It held, moreover, that the findings of the inferior court, being interlocutory, not final, in their nature, could not under the Alabama statutes be reviewed by the Supreme Court on appeal on writ of error. (104 So. 814.)

Award of $14,000 Held Excessive for Death of Workman Employed by Electric Utility Company. — In Southern Utilities Company vs. Davis, the Supreme Court of Florida held that while the question of the amount of damages recoverable in an action for death by wrongful act is peculiarly one within the province of a jury, and although its finding should not be set aside as excessive unless the result of passion or prejudice or of a palpable mistake in applying the rules of law, $14,000 was excessive for the death of a laborer when his character, conduct and business capacity were considered. The court further held that while there was substantial evidence of contributory negligence on the part of the man killed, a jury had twice found against the company and the court was not justified in disturbing its verdict. (105 So. 315.)

Rates Fixed Only for Experimental Period Cannot Be Deemed Unreasonable —Deductions from Valuation Must Not Affect Rate Unfairly.—In a case where both the expected revenue and the operating expenses for the period of the rate were estimates which might or might not turn out to be correct, and where the rate was fixed for only a short period, during which the company was required to make quarterly reports of operations under the rate, the Public Service Commission's order could not be deemed unreasonable, even if the rate did give promise at the time of paying a return on the investment somewhat higher than the commission might consider a sufficient return. This finding was made by the Missouri Supreme Court in City of St. Joseph vs. Public Service Commission. In the same case the Supreme Court held that, even if the commission did include in its valuation items which the evidence did not justify, the court on review cannot merely deduct from the valuation for the errors made, but must go further and find out whether, after making all proper corrections in the valuation, the value remaining is sufficient to support the rate fixed.

Manufacturing and Markets

Federal Business Policy

Analysis of Ten Years' Experience of Regulation by National Industrial Conference Board

GOVERNMENT policy toward business is undergoing a significant change, according to a report by the National Industrial Conference Board, 247 Park Avenue, New York, on the "Regulation of Competitive Practices." "Big business" no longer is considered "bad" just because it is big, the Conference Board finds in tracing the evolution of federal policy toward the consolidation movement. On the contrary, in the view of the board, recent administrative and judicial policy reflects a growing tendency to recognize that the larger corporations are as a rule among the most honestly and fairly conducted business concerns. Only comparatively few of the corporations cited for violations of the law, it is pointed out, have been firms such as are popularly known as "trusts," most of the orders of the Federal Trade Commission "to cease and desist" from predatory practices having been issued against obscure concerns of slight importance in their respective lines of trade.

Governmental regulation of business, however, no matter how wisely conceived or how efficiently administered, while perhaps necessary for a small section of the business world, can never do as well as business can do for itself. This is the general conclusion of the board's comprehensive analysis of the ten years' experience under the Clayton and Federal Trade Commission acts. Of much greater significance and importance to the economic life of the nation, in the light of the board's study, is the regulation of business from within.

CHAMPIONS SELF-REGULATION

This, the report declares, is not to deprecate the accomplishments of government regulation or the Federal Trade Commission's record, but to emphasize that "the real basis for hope of the preservation of the competitive system of business enterprise lies in its own power of self-regulation." While the Trade Commission has been of value in relieving the congestion of the courts and while its activities are effective in many cases of unfair competition where appeal to the courts is impracticable, much is also being accomplished in a positive way by the growing activity of voluntary business associations in purging industry and trade of undesirable tactics. While government regulation is useful and effective in a negative way, says the board's report, the initiative of trade bodies in ridding commerce and industry of unfair practices is more significant of the "transformation now going on from cut-throat warfare for profits toward a more chivalrous competition."

The summary procedure of the Trade Commission, according to the report, has helped to prevent a further clogging of the already crowded court dockets. During its ten years of existence the commission has taken under advisement 8,632 requests for action to prevent unfair competition. Of these, 3,691 were filed as applications for complaint, thereby becoming the subject of official investigation, while 4,727 were definitely rejected for lack of jurisdiction or similar cause. Out of the total of 3,691 formal applications, the commission dismissed 2,058 after investigation and issued complaints in 1,197 cases. There have been 933 complaints finally disposed of, of which 635 resulted in orders "to cease and desist." From only 8.6 per cent of the orders of the commission was appeal taken to the courts. This, together with the fact that few complaints were issued against large corporate consolidations, most of them being directed against firms of moderate size, in the view of the Conference Board, tends to confirm the belief that there is a definite place in our government economy for such an administrative tribunal to curb the activities of transient concerns using fraudulent or predatory tactics to the detriment of all business.

COMMISSION TOO SLOW

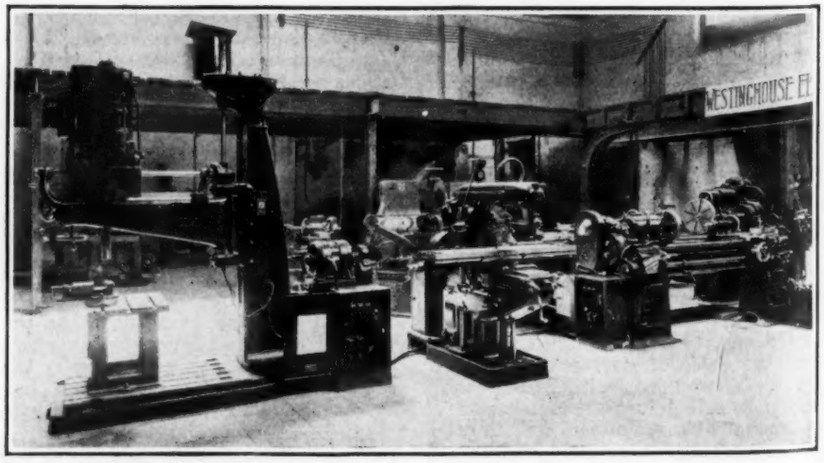
Further checking up the record of the Trade Commission, the Conference Board finds that it does not function with the dispatch necessary for effectiveness. The number of cases pending is steadily increasing and since 1923 has averaged about 250. Much confusion has resulted, the Conference Board study points out, from mistaking the character of the commission's function as intended by Congress. It is an error, according to the report, to look upon the commission as a special court responsible for the interpretation of certain statutory laws or as a grand jury finding indictments. It was intended, in the view of the board, as a fact-finding tribunal, quasi-judicial in character, with summary procedure, which would relieve the courts from much business often not easily or effectively dealt with by courts, while leaving the safeguards of legal justice unimpaired, as the commission has no power to impose penalties and its orders are subject to final scrutiny by the courts.

Developing Electrical Trade in Mexico

What One Company Has Done to Promote Confidence in Electrical Equipment by Establishing a Service Department—Utilization of Apparatus Enhanced

THERE are many difficult problems confronting the electrical industry in Mexico, but the greatest of these, which must be overcome before the electrical industry can obtain a firm hold in that country, are the natural timidity of the Mexican people in using electrical apparatus, the resulting lack of confidence in such equipment and the deplorable scarcity of high-grade consulting-engineering firms within that country. To eliminate these difficulties and to create a feeling of confidence in the use of electrical equipment, the Westinghouse Electric International Company has installed and put into operation in Mexico City a repair shop and a service department. The existing conditions blend themselves naturally in these two groups of service, the inside service being cared for by the repair shop, while the outside service is handled by the service department.

Years of experience with electric repair shops in the United States have



MACHINE SHOP IN SERVICE DEPARTMENT OF WESTINGHOUSE COMPANY IN MEXICO

made it possible for the Westinghouse company to install a modern, well-equipped repair shop in Mexico City. All the equipment and tools are equipped with electric drive throughout. Work brought to the repair shop is repaired according to factory specifications. Every rewinding and coil job, for example, is referred to the factory engineers, who supply the correct specifications, together with processes for manufacture and insulation for that particular work. The apparatus is then properly tested in the shop, which is equipped with apparatus to measure not only electric strength but dielectric and insulating strength as well. A large part of the repair-shop work consists of the manufacture of new switchboards from native marble.

CONDITIONS DICTATE METHODS

Conditions peculiar to foreign countries, particularly in larger concerns, bring special changes to the service department. In the United States it is a logical proceeding to send a burned-out motor to the nearest repair shop for complete repair. In Mexico, however, the general practice is for the user to procure new coils and to install them himself. Probably the most important function of the service department is filling a gap caused by lack of high-grade consulting engineering firms.

As a remedy the service department performs various duties ordinarily allotted to the engineer. First, a periodic electrical inspection of plant and apparatus is offered to the various companies. The inspections include tests and calculations when necessary. For example, insulation measurements give advance information of weakened apparatus before its ultimate burn-out. Second, supervision of erection or of the initial start-up provides additional confidence in the apparatus and assurance of its proper functioning. Third, electricians available to correct trouble when called serve the electrical public in a most useful manner. Lastly, engineering service is offered to those whose problems are of an engineering and electrical nature. Not only the engineers of the service department, but through them the whole engineering organization and experience of the Westinghouse company, are made available to all who solicit the service. Reports on work of this nature are referred to factory engineers, who give the added benefit of advice from the whole engneering department of the company. Losses through improper applications are investigated and uncovered, and tests and calculations of an electrical and allied nature are made.

ULTIMATE RESULT VALUABLE

Improvements both in the type of equipment used and the design and installation of such apparatus are bound to result from the service and aid extended to the various companies through the repair shop and service department. The most important ultimate result, however, will be the education and enlightenment of the native Mexicans to the utilization and value of electrical equipment, with a corresponding increase in the demand for all kinds of electrical material.

Electric Association Formed in Chicago District

The Electric Association has been organized in the Chicago district, with objects similar to those of an electric league, to function as a social organization for members and to be representative of every branch of the electrical industry. Its first board of directors includes executives of power companies, traction companies, telephone companies, electrical manufacturers, supply jobbers, contractor-dealers and others. The avowed purpose of the new organization is to promote the Chicago district and to bring about a closer cohesion and understanding among the various branches interested in the advancement of the industry.

The present board of directors are:

Electric Supply Jobbers' Group.—N. G. Harvey, Illinois Electric Company; W. W. Low, Electric Appliance Company.

Electrical Manufacturers' Group.—G. A. Hughes, Edison Electric Appliance Company; T. C. Russell, Russell Electric Company; N. G. Symonds, Westinghouse Electric & Manufacturing Company; H. L. Monroe, General Electric Company.

Fixture Manufacturers' Group.—Augustus D. Curtis, Curtis Lighting, Inc.; F. Lee Farmer, Beardslee Chandelier Manufacturing Company.

"At-Large" Group.—Samuel Neiler, Neiler-Rich Company; A. A. Gray, A. A. Gray & Company.

Public Utilities Group.—John F. Gilchrist, Commonwealth Edison Company; F. O. Hale, Illinois Bell Telephone Company; E. W. Lloyd, Commonwealth Edison Company; H. M. Lytle, Chicago Rapid Transit Company.

Electrical Contractors' Group.—William McGuineas, United Electric Construction Company; J. N. Pierce, Pierce Electric Company.

Electrical Contractor-Dealers' Group.—W. T. Hopkins, Calumet Electric Company; Thomas G. Meade, Meade Electric Company.

Business Conditions

SALES during the third quarter of the year are reported by many manufacturers as being somewhat better than was estimated. The demand for substation equipment was unusually good and several large orders were placed during the quarter. Building construction material is in active demand, and industrial plants are purchasing conservatively but steadily. Wire and cable sales have been exceptionally good. There is no indication of overstocking as orders are small and frequent with constant requests for immediate shipment. Some manufacturers believe that distributors are even more conservative than business actually warrants.

For the last quarter of the year the industry does not anticipate the sale of a great deal of heavy apparatus, but an improved volume of business is expected in supply lines, small equipment and industrial and merchandise lines—more than sufficient to offset any decrease in heavy-apparatus sales. In scheduling production operations for the last quarter manufacturers have been optimistic. One company states that the outlook is quite reassuring and, as far as present indications go, a busy quarter year is expected. More than one company also say that its production schedules look quite big, yet there is no justification for lowering them.

Jobbers report a decided upward trend after a slack summer period. More orders are being placed by contractors as well as by industrial firms, and reports from salesmen in the various territories indicate a very active period for the rest of the year. Steel consumption is greater than anticipated and operation continues at about the same rate as at the end of August. Conditions in that industry are steady with no indications of a change.

In the New England district several large contracts for electrical machinery have been placed, building supplies continue to move actively, domestic appliances are selling with increasing vigor, and electrical refrigeration continues to command especial interest, despite approaching seasonal changes. Sales in the New York district were in large volume, with the individual orders mainly small. Wire and cable purchases have been good, and industrial plants are purchasing steadily. In the Southeast a more optimistic tone is evident, and though sales are spotty, the volume of business transacted is satisfactory.

Trade in southeastern Georgia and in Florida is quite active. Business continues on an even basis in the Middle West and optimism prevails. Construction programs of utility companies in that district are creating a good demand for distribution material. On the Pacific Coast buying is in good volume. Some large orders have been placed but the bulk of purchases is small.

Non-Ferrous Metal Market Quiet—Prices Steady

NO PRICE changes of importance have marked the non-ferrous metal market, and business is quiet. Copper has weakened slightly, though the large producers have marketed moderate tonnages throughout the week at 14½ cents delivered. The dormant condition of the European metal market, which has been in evidence now for several weeks, has prevented any advance in metal prices and has brought about a slight recession in copper. Various prices have been obtained for the copper sold. Such lots as were sold for delivery over the next three months realized 14½ cents, but no one seller was able to

NEW YORK METAL MARKET PRICES

	Sept. 23, 1925 Cents per Pound	Sept. 30, 1925 Cents per Pound
Copper, electrolytic	14½	14.35–14.50
Lead, Am. S. & R. price	9	9
Antimony	17–17½	17½
Nickel, ingot	33–34	33–34
Zinc, spot	8.20–8.22½	8.22½
Tin, Straits	58½	59½
Aluminum, 99 per cent	28	28

Base copper price Sept. 30, 1925, 16½ cents

market a very large tonnage at that level. More active selling was done at concessions, and on Tuesday and Wednesday particularly the large producers found it difficult to attract buyers without cutting prices. Most manufacturers of copper and brass are decidedly optimistic over prospects for a good fall business.

The American Smelting & Refining Company continues its official contract price for New York lead at 9¼ cents. The leading interest in the Middle West is selling at 9.25 cents to some of its regular customers, but coincidentally is making large sales at the average quotation. The demand for zinc from galvanizers has been of fair proportions. A slight recession, probably responding to the London influence, brought out a little of the metal from small producers and resellers at 7.80 cents, but with an improvement in export inquiry the price is back at the level of a week ago. Most of the sales have been for prompt or October shipment, and the indications are that consumers with only one or two exceptions have provided only for their current requirements. A decided increase in strength has developed in the tin market.

Buying in Good Volume on the Pacific Coast

MANY wire orders and inquiries continue to be received on the Pacific Coast. An order for 2,000,000 ft. of rubber-covered wire for the Philippines, an inquiry for 5,000,000 ft. of rubber-covered wire for a power company and several orders for 20 to 30 miles of iron wire, 10,000 ft. to 20,000 ft. of three-conductor telephone wire and elaborate colored assortments of artificial-silk lamp cord have been reported. Other outstanding orders cover 1,000 lb. insulating tape, 1,500 Edison battery renewals, 180 25-ft. poles, 500 stand-lamp clusters and fifty loud speakers. The general run of business is in rather small orders, However, power companies, industrial plants and oil companies are being represented in the market by many small orders for tools, fuses, lighting units, strain insulators, etc., all apparently for repair and maintenance work instead of for stock.

Railroad purchases have covered many small miscellaneous items, outside of one order for 150 miles of 52-in. No. 8 iron bond wires. Dealer business is fine, and advance orders for October 1 shipment are fairly large and very well assorted. A series of novel window-lighting displays by a San Francisco power company has produced orders from several dealers for two, three and four dozen shipments of reflectors and spotlights. A greatly improved business in vacuum cleaners and washing machines is reported. Purchases by the lumber industry are not so good as was expected, but inquiries for equipment for several new mills have been received, and indications are that many sales will be made later in the year.

Sales in New York District in Large Volume—Orders Small

SALES in the New York district, which showed a slackening earlier in the month, are reported by several manufacturers as again increasing, so that the volume of business transacted in September is satisfactory. Business during the third quarter of the year has been better than expectations in the majority of cases, and there is no indication of any likely decrease. No very large orders have been placed in the district, the business consisting mainly of small orders. Wire and cable orders have been placed in very good volume throughout the last three months, and although manufacturers expect a slight seasonal falling off, the outlook is considered to be reassuring.

Industrial plants are purchasing steadily, and sales of wiring devices are reported as very good by manufacturers. Jobbers state that such purchases are mainly for stock but are based on reports of greater activity among contractors, with prospects for good business the rest of the year. On the whole, buying is conservative and the majority of demands are for prompt delivery.

Several Large Contracts Placed in the New England District

SEVERAL large contracts for electrical machinery have been closed in the New England district. A contract for a 9,000-kva. automatic-control waterwheel generator has been placed, as well as an order for switches and control apparatus amounting to about $70,000, the latter to be delivered to a Southwestern utility property. Other large contracts of interest include an order for a 4,000-kva. waterwheel generator and an order for thirty-five motor-driven multi-unit type passenger coaches for the New Haven railroad.

Electrical building supplies continue to hold strong interest in the electrical market, with wire, pipe, conduit and hardware in good demand. Lighting fixtures and wiring devices also are selling well, and jobbers report an encouraging volume of counter sales of these supplies and equipment. Domestic appliances are selling with increasing vigor. One group, consisting of fourteen central-station companies, records an increase for the week ended September 19 of 40 per cent over the receipts for the corresponding week in 1924. Despite approaching seasonal changes, electrical refrigeration continues to command especial interest.

Value of Electrical Exports for July, 1925, Compared with Corresponding Month in 1924

(Issued by Bureau of Foreign and Domestic Commerce)

Articles	July 1924	July 925
Generators:		
Direct-current:		
Under 500 kw.	$92,046	$69,343
500 kw. and over	29,876	65,110
Alternating-current		
Under 2,000 kva.	5,274	18,556
2,000 kva. and over	81,581	96,594
Steam-turbine generator sets.	1,467	13,767
Accessories and parts for generators	174,716	120,925
Self-contained lighting outfits	60,424	87,660
Batteries:		
Flashlight batteries	67,554	96,219
Other primary batteries	60,609	136,048
Storage batteries	221,469	193,271
Transforming or converting apparatus:		
Power transformers	298,817	180,043
Other transformers	181,408	66,988
Rectifiers, double-current and motor-generators, dynamotors, synchronous and other converters	39,249	29,642
Transmission and distribution apparatus:		
Switchboard panels, except telephone	196,480	272,919
Switches and circuit breakers over 10 amp.	222,362	95,855
Fuses and fuse blocks	17,987	32,289
Watt-hour and other measuring meters	21,196	30,546
Volt, watt and ampere meters and other recording, indicating and testing apparatus	117,424	84,936
Lightning arresters, choke coils, reactors and other protective devices	69,381	55,709
Motors, starters and controllers:		
Motors, under 1 hp.	113,943	154,387
Stationary motors:		
1 to 200 hp.	150,025	147,629
Over 200 hp.	24,213	15,433
Railway motors	109,504	43,064
Electric locomotives:		
Railway	411,495	14,525
Mining and industrial	17,456	21,093
Starting and controlling equipment for:		
Industrial motors	102,546	86,471
Electric railway and vehicle motors	1,090	22,634
Accessories and parts for motors	117,771	206,347
Electrical appliances:		
Electric fans	77,747	97,263
Electric lamps:		
Metal-filament	101,655	107,650
Other electric lamps	32,135	13,056
Flashlights	$67,648	$120,424
Searchlights and projectors	35,228	71,411
Motor-driven household devices	69,592	90,597
Domestic heating and cooking devices	64,170	99,926
Industrial electric furnaces and ovens	20,643	12,276
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries, etc.	83,042	123,110
Signal and communication devices:		
Radio apparatus	297,586	643,463
Telegraph apparatus	20,608	35,600
Telephone apparatus:		
Magneto telephones	16,346	9,772
Other telephones	19,306	54,776
Telephone switchboards	159,977	50,555
Other telephone equipment	135,466	158,744
Railway signals, switches and attachments	88,245	50,227
Bells, buzzrs, annunciators and alarms	9,991	17,080
Other electric apparatus:		
Spark plugs, magnetos and other ignition apparatus	168,629	287,915
Insulating materials	95,345	131,061
Melt conduit, outlet and switch-boxes	49,676	53,356
Sockets, receptacles and lighting switches	96,589	147,020
Electric lighting switches, interior and streets	40,684	93,208
Other wiring supplies and line material	81,900	77,899
Other electrical apparatus	522,292	514,617
Globes and shades for lighting fixtures	25,416	40,754
Electrical glassware, except for lighting	20,889	25,306
Electrical porcelain	114,193	†
Electrical porcelain for less than 6,600 volts	*	83,073
For 6,600 volts	*	61,077
Electrical carbons, carbon brushes and electrodes	184,661	†
Electrodes for electric furnaces.	*	33,712
Other carbon products	*	205,866
Insulated wire and cable (iron and steel)	33,564	10,171
Other manufactures of aluminum	123,573	92,527
Copper, bare wire	109,970	93,429
Copper, insulated wires and cables	267,280	361,149
Total electrical machinery and apparatus and supplies	$6,240,409	$6,526,668

*Not separately stated prior to January 1, 1925
†Discontinued beginning January 1, 1925

Manufacturers report good activity in sales of electric refrigerators. Overtime production is also reported and increasing difficulties in deliveries are experienced owing to the many large apartment-house installations. Real-estate operators in this district are reporting that future building projects for housing must consider electric refrigeration service for the tenants.

Optimistic Tone in Southeast—Sales Spotty but Satisfactory

A MORE optimistic tone to business generally is evident in the Southeast, and an improvement is noted in virtually all lines. The territory, however, continues very spotty as many sections have been hard hit by the drought. In some sections there are still no indications of rain to break the long-continued drought, and business depression is particularly noticeable in these localities. South Carolina in the western and northern part is reported particularly dull, and prospects for improvement in the fall are slight. Northeast Georgia is slow, but the volume of business from the state as a whole is satisfactory, with south Georgia quite active—an activity partly due to the expansion program of the Georgia Southern Power Company. The construction of several transmission lines is planned by this company for the near future.

Fall buying is beginning to be evidenced in increased orders for heating devices and appliances, vacuum-cleaner sales having been boosted considerably by recent campaigns, and flatirons are selling briskly. Radio bids fair to get back into its old position of the demand exceeding the supply. Sales of ranges are reported fair to good, while house-type watt-hour meters and distribution transformer orders are about normal. Florida continues very active in all lines of electrical business, the largest order received from that state last week being one for $40,000 worth of "white-way" equipment.

Business Continues on Even Basis in the Middle West

BUSINESS in the Middle West continues on the even basis evidenced thus far throughout the year. Optimism prevails, although some slackening off in sales of certain lines of manufacture is looked upon with a little apprehension. The utility companies are expanding generally under construction programs laid down earlier in the year, and preparations are being made for future expansion. There has been a good demand for distribution transformers, poles, pole-line hardware and meters. An interesting order for 7,000 watt-hour meters was placed this week by one central-station company, while another is accepting contracts covering a large amount of weatherproof wire. A manufacturer of busbar copper reports receiving a large order. Jobbers' sales are good, with a seasonable demand for heaters, percolators and other appliances, and radio sales have accelerated. The city of Chicago is accepting bids on a large quantity of street-lighting equipment.

Activities of the Trade

Welsbach Announces New Electric Street Lighting Service

Announcement has been made of the new service for the installation and maintenance of electric street-lighting systems by the Welsbach Street Lighting Company of America, 1934 Market Street, Philadelphia. For years the company has engaged extensively in street lighting with gas, and it is now performing a similar service in street lighting with electricity, having extended its field of operations to embrace the installations and maintenance of electric street-lighting systems. It will maintain such systems under contract with either the municipality or the central-station company, as local conditions may require.

In addition to its maintenance service, the company will furnish, erect and install the necessary posts, cables and equipment for new installations or for additions and improvements to existing systems. For this class of work the company states that it has a well-organized and efficient construction force, which has been engaged for the past ten years in the installation of ornamental electric street-lighting systems. The company also offers the assistance of its engineers in the preparation of plans and specifications.

Trade Board Issues Complaint Against Aluminum Company

Complaint has been issued by the Federal Trade Commission against the Aluminum Company of America charging that company with practices which are alleged to lessen competition and tend to create a monopoly in aluminum in the United States. Among other things the commission charges that the Aluminum company has adopted and maintained the practice of entering into contracts or agreements for the sale, and is now selling and making contracts for the sale, in interstate commerce of bargain sheet aluminum to manufacturing industries at prices less than they have been and are selling virgin sheet aluminum to jobbing foundries.

The Aluminum company denies the complaint and in its reply to the commission goes into considerable detail as to the allegations contained in the complaint. The company flatly denies the charge that for more than two years past it "has employed and is still employing a scheme the purpose of which was and is to gain and maintain a monopoly" of aluminum raw material, ingots and sheets, fabricated and alloy products. The Aluminum company requests a dismissal of the complaint and in its answer refers to the fact that since 1907, when its patents expired, the processes involved have not only been continued by the respondent but also by all other manufacturers of aluminum in the world. The company further states that it has been its policy to give the consumers of aluminum the advantage of the lowest possible prices and that such complaints as have arisen against the company come largely from middlemen who have found that the company's policy limits their profits.

Servel Announces Opening of Executive Offices in New York

The Servel Corporation announces the establishment of executive offices at 51 East Forty-second Street, New York City. The entire eighteenth floor of the Vanderbilt Building at the above address is devoted to the executive and general offices of the corporation. The company states that its manufacturing plants provide the most modern facilities and production is proceeding on a large scale. Servel units for domestic installation are manufactured at Evansville, Ind., while units for commercial installation are made at Carteret, N. J., and Newburgh, N. Y. The corporation further states that it is now prepared to ship all models with reasonable promptness and to meet the rapidly increasing demand for its products.

The Pettingell-Andrews Company of Boston has opened a branch at 116 Liberty Street, Springfield, Mass., for sales of electrical and radio goods. This branch will cover all of western Massachusetts and portions of southern Vermont and northern Connecticut. W. H. Kaiser, for some time sales representative for the company in Springfield, will be the branch manager.

The Benjamin Electric Manufacturing Company, Chicago, manufacturer of industrial lighting equipment, etc., announces that Thomas F. McDonough, former Seattle representative of the company, has been transferred to San Francisco. He is succeeded in Seattle by T. W. Carlson.

The Kuhlman Electric Company, Bay City, Mich., announces the appointment of the D. H. Braymer Equipment Company, 727 W.O.W. Building, Omaha, as district representative for Iowa and Nebraska.

The Hi-Voltage Equipment Company, 3305 Croton Avenue, Cleveland, announces that Frederick K. Northrop has been appointed New York district manager and will be at the company's recently opened offices at 50 Church Street, New York, to handle its expanding business in high-voltage outdoor switching and substation equipment in that vicinity. Mr. Northrop was formerly connected with Stevens & Wood, working on the development of the superpower system of the Pennsylvania-Ohio Power Company.

Edward T. Moore, 500 Cahill Building, Syracuse, N. Y., consulting engineer and manufacturer of the "Edmoore demand limitator," has recently received orders for "limitators" from the following concerns: Harrison Radiator Company, Lockport, N. Y.; Le Moyne Steel Company, Monongahela, Pa.; Pittsburgh Valve Foundry & Construction Company, Pittsburgh; Chicago

Steel Foundry Company, Chicago; Warman Steel Castings Company, Los Angeles, and Detroit Steel Castings Company, Detroit.

Weiss & Biheller, Inc., 584 Broadway, New York, announce that they are distributors in the United States and Canada for the "Simplex" solderless connector made by the Ramie Union in Holland. The "Simplex" connector is made of a single piece of porcelain.

The Irvington Varnish & Insulator Company, Irvington, N. J., announces that Charles E. Garneau, who for many years handled the development of the company's insulation products and sales, has been appointed sales manager.

The Southern Electric Company, Richmond, Va., electrical supply jobber, announces that it has now moved to its new home at Fourth and Canal Streets, where it is provided with greatly enlarged facilities for serving the trade.

The Circle F Manufacturing Company, Trenton, N. J., manufacturer of electrical and porcelain specialties, announces that the Robertson-Cataract Electric Company, with stores in Buffalo, Rochester, Syracuse and Utica, has become a distributor of the Circle F line of wiring devices and is now carrying complete stocks.

The Delco-Light Company, Dayton, Ohio, manufacturer of the "Frigidaire" electric refrigerator, farm-lighting plants, etc., announces that F. H. Arnold, Jr., for a number of years associated with the Delco-Light distributor's office at Toledo, Ohio, on September 1 became branch manager of the Providence (R. I.) sales branch. F. B. Williams, formerly associated with E. A. Fisher in the Worcester Frigidaire sales branch, on the same date became branch manager of that branch. Both territories were formerly covered by Mr. Fisher and operated under the Providence Frigidaire sales branch. Mr. Fisher is returning to the Frigidaire sales division of the Delco-Light Company at Dayton.

The R. H. Beaumont Company, 319 Arch Street, Philadelphia, has just received a contract for the coal-handling equipment in connection with the Delray station of the Detroit Edison Company. The equipment includes two 200-cu.ft. skip hoists automatically loaded by patented "Simplex" loaders. The skip hoists have a capacity of 400 tons per hour.

The Eagle Electric Manufacturing Company, 40 South Eighth Street, Brooklyn, N. Y., has recently placed on the market the Eagle "Hiheet" electric iron. The company formerly manufactured iron replacement elements and in the last five years produced more than a quarter of a million such elements.

The National Electric Supply Company, Washington, D. C., will shortly open a branch at 333 South Davie Street, Greensboro, N. C.

The Tubular Woven Fabric Company, Pawtucket, R. I., manufacturer of nonmetallic conduit, armored cable, insulated wires and cords, etc., announces that R. L. Bradbury has been appointed district manager for its New York office. Mr. Bradbury was formerly connected with Robert J. Smythe, manufacturers' representative.

The Electric Controller & Manufacturing Company, 2700 East Seventy-ninth Street, Cleveland, announces the appointment of Eicher & Bratt, Seattle, as representatives for Oregon, Washington, Alaska and the "Panhandle" district of Idaho. In addition to handling the E. C. & M. lines, Eicher & Bratt also represent in their territory the Pittsburgh Transformer Company, the Jewell Electric Instrument Company and the Electric Power Equipment Corporation.

Pass & Seymour, Inc., Solvay Station, Syracuse, N. Y., manufacturer of standard electric wiring devices, is now offering a new transformer cut-out with a long tapered handle and a new body design, known as the P & S 139½ transformer cut-out.

New Equipment Available

Mine Motor

A new type of totally inclosed motor with control, especially adapted for use in gaseous mines and designed by the General Electric Company, has successfully passed the tests of the United States Bureau of Mines. The primary use for which the motor was designed is for driving mine gathering pumps, but it is expected that other uses will be developed. The motor is a direct-current machine and so far has been made in but one rating—5 hp., 900 r.p.m., 550 volts, compound-wound. Other ratings, however, are to be designed and submitted for approval as required. The General Electric designation for the new motor is type ME-6, class BM construction.

Motor and Generator Brush

A motor and generator brush built of graphite and "bakelite" has been placed on the market by the Henrite Products Company, Inc., Morgan and Washington Streets, Jersey City, N. J. The brush has a cross-sectional resistance several times the longitudinal resistance, though with undiminished carrying capacity, thus providing the essential requirements for sparkless commutation. It is said that the materials are combined under definite controllable conditions and produced with predetermined properties.

These brushes can be made in any size desired and are also available for use on repulsion-induction motors. They can also be furnished with any cross-sectional resistance, which may be varied to suit the particular commutation conditions, and can be used on motors and generators of any voltage.

Motor Starter and Reversing Switch

A motor starter and reversing switch, known as the type WK-21, has been developed by the Westinghouse Electric & Manufacturing Company. This equipment is said to be particularly useful in the textile industry, where it is used to reverse the direction of the motor on carding machines. In this motor starter and reversing switch the main door is interlocked so that it cannot be opened while the motor is running. Access can thus be had to the reversing switch, which is under the main door, only when the switch is off and the motor is not running. While this door is open all accessible parts of the switch are dead, and the switch cannot be turned on until the main door is closed. Protection for the motor, for both starting and running either forward or reverse, is provided by means of cartridge-type thermal cut-outs.

Elevator Tructor

A new type of portable-battery-driven furnace charger has been placed on the market by the Elwell-Parker Electric Company, Cleveland. The unit is propelled by an Elwell-Parker electric motor and is steered on all four rubber-tired wheels. The load supports consist of two 92-in. x 8-in. horizontal fingers upon which ten 300-lb. packed furnace boxes are placed. The bottom of the furnace is provided with two slots to receive the lower flanges of the fingers. The furnace floor between and at each side of the slots supports the boxes or pots when the fingers are lowered and withdrawn. The furnace is set above the floor to provide clearance for the smaller axle thrust beneath the furnace when charging or discharging.

Drum Switch

A thirty-one-point drum switch having a wide range of control has been developed by the General Electric Company. The switch is made in two types which bear the designations T-1505 (150 amp.) and T-1506 (300 amp.). This switch is particularly applicable to the regulation of induced-draft fans in pulverized-coal-burning plants where fine regulation is necessary. Very fine speed regulation is claimed for this new, thirty-one-point drum switch when used with one motor, and for two-motor control it is said that it can be used to replace the two drum switches and master switches formerly employed.

Traffic Control.—The "Reco" combination manual and automatic traffic control for street intersection towers and signals has been placed on the market by the Reynolds Electric Company, 2650 West Congress Street, Chicago. The mechanism is of the variable type so that traffic in either direction can be timed to meet conditions as they are. The manual control consists of a drum with a handle equipped with three stops so that traffic can be regulated by the hand method. The cabinet is made of cast iron and contains the necessary service switch, switch for night light, plug fuses and fuse blocks, as well as the throwover switch.

New Trade Literature

AIR COMPRESSORS. — The Dunning Compressor Company, Holmesburg, Philadelphia, has issued a catalog describing its heavy-duty air compressors.

DISCONNECTING SWITCHES.—"Outdoor Group - Operated Disconnecting Switches" is the title of bulletin No. 204 issued by the Electric Power Equipment Corporation, Philadelphia. The bulletin describes the construction details of group-operated "Elpeco" disconnecting switches and contains dimensioned diagrams of the various types. An illustrated description of the motor-operated disconnecting switch gear is also included, as well as photographs of installations using "Elpeco" group-operated "disconnects."

MAGNET WIRE AND INSULATION. — The Acme Wire Company, New Haven, Conn., has issued a complete catalog in four sections. Section 1, on magnet wire (including special wires), contains complete tables of diameters, lengths, etc., of different types of magnet wire. Section 2 covers complete magnet-wire specifications. Section 3 covers coil windings and describes ignition coils, transformer coils, meter coils, field coils, etc. Section 4 describes the Acme varnished insulators, cambrics, papers, silks, slot insulation and tubing.

ELECTRICAL MEASUREMENTS.—The Weston Electrical Instrument Corporation, Newark, N. J., has issued a 155-page book entitled "Electrical Measurements and Meter Testing in the Power Station." The book contains engineering and operating suggestions for the standardizing and electrical laboratories of the public utility. It has been prepared with the object of assisting owners of Weston instruments to use and care for their instruments to best advantage, and it contains chapters on designing and equipping a laboratory, instrument corrections, conducting tests in the field, inspection of meter equipment, testing electrical appliances, etc.

AIR FILTER.—A bulletin describing the Midwest air filters has been issued by the Midwest Air Filters, Inc., 100 East Forty-fifth Street, New York. The Midwest principle is described in the bulletin, and a list of applications of the filter in the electrical field is included.

SIGNAL SYSTEMS.—Bulletin No. 104-29-B issued by Charles Cory & Sons, Inc., 183 Varick Street, New York, covers the Cory audible and visible signals and turbine order systems. The bulletin contains a description of the system with the types of instruments illustrated. The Cory Record ohmmeter is also described in this bulletin.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Vienna, Austria (No. 16952), for electrical goods, technical equipment and novelties; (No. 16,965) for cheap radio sets.

An agency is desired in Paris, France (No. 16,918), for electric household appliances.

Purchase and agency is desired in Fulda, Germany (No. 16,923), for electric household appliances.

Purchase and agency is desired in Berlin, Germany (No. 16,986), for electric machinery, industrial and household appliances; (No. 16,925) for specialized machinery for aluminum, electrical and chemical manufacturing industries.

An agency is desired in Amsterdam, Netherlands (No. 16,954), for radio sets and parts.

Purchase and agency is desired in Valencia, Spain (No. 16,985), for radio telegraphoscope apparatus.

Purchase or agency is desired in Riga, Latvia (No. 16,903), for electric signs and household laundry machinery.

An agency is desired in Bradford, England (No. 16,953), for voltmeters, pocket and panel type.

Purchase is desired in Cape Town, South Africa (No. 16,909), of concrete-mixing machinery, with oil engines or electric motors.

An agency is desired in Granada, Spain (No. 16,999), for small and medium-sized Diesel oil engines.

INSULATED COPPER WIRE FOR MONTEVIDEO, URUGUAY.—Bids will be received by the General Administration of the State Electric Company, Montevideo, Uruguay, until Dec. 28, for 1,060,000 meters of insulated copper wire. A copy of the specifications, in Spanish, may be obtained from the Electrical Equipment Division, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., by referring to No. 31,142.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

BELMONT, MASS.—Work will soon begin on the construction of a substation on Concord Avenue, to cost about $22,000, in connection with the municipal lighting system.

CHELSEA, MASS.—The Eastern Massachusetts Street Railway Company, Boston, plans to rebuild its local power plant, recently damaged by fire, with loss of about $25,000.

LAWRENCE, MASS.—Bids will be received by the Director of Engineering of the City of Lawrence until Oct. 5 for waterworks pumping and boiler equipment, including one turbine-driven centrifugal pumping unit, complete with all auxiliaries, and one motor-driven pumping unit in the present waterworks station. Morris Knowles, Inc., Pittsburgh, Pa., is engineer.

Middle Atlantic States

ALTONA, N. Y.—Permission has been granted the Champlain (N. Y.) Electric Company to exercise a franchise in the town of Altona. A transmission line will be erected from Mooers, a distance of about 4 miles. The cost is estimated at about $10,000.

BROOKLYN, N. Y.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Nov. 17, for eighteen electric generating sets and spare parts (Schedule 4392).

BUFFALO, N. Y.—The Public Service Commission has granted the Niagara, Lockport & Ontario Power Company permission to exercise franchises granted by the Town Boards of Redhouse, South Valley, Freedom, Elko and Farmersville. The company also proposes to erect a transmission line from Freedom to Elko and to Farmersville.

GROVELAND, N. Y.—The Village Board has plans for a local street-lighting system, to cost about $25,000.

JOHNSBURY, N. Y — The Adirondack Power & Light Corporation, Amsterdam, has closed negotiations for the purchase of the plant and system of the North Creek Electric Company and contemplates extensions in its transmission lines in this section.

NEW YORK, N. Y. — Guggenheim Brothers, 120 Broadway, metals, plan the construction of a hydro-electric power plant at their recently acquired tin properties in Bolivia, estimated to cost $150,000.

NORTH HARMONY, N. Y. — The Town Board has preliminary plans for highway illumination to cost about $5,000.

STRYKERSVILLE, N. Y. — The Town Council has contracted with the Lancaster & Depew Electric Company, Lancaster, for the installation of an improved lighting system on all important streets.

WATERTOWN, N. Y.—Plans have been approved for an ornamental street-lighting system.

WEST MILFORD, N. J.—The Public Service Commission has directed the Orange & Rockland Electric Company, Monroe, N. Y., to make extensions and improvements in its system at West Milford and vicinity.

FRANKLIN, PA.—Plans are under way by the Citizens' Light & Power Company, the Petroleum Telephone Company and the Western Union Telegraph Company for placing their overhead wires in the business section in underground conduits.

OAKMONT, PA.—The Duquesne Light Company, Pittsburgh, has applied for permission to erect a 22,000-volt transmission line across the Allegheny River at Oakmont.

CUMBERLAND, MD.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 20, for remodeling the electric passenger elevator in the United States court house and post office at Cumberland, Md. For details see Searchlight Section.

ARRINGTON, VA.—The Standard Soapstone Corporation, recently organized, has taken over the entire assets and business of the Phoenix Stone Company, Inc., New York City, with plant in Arrington. The company is building a 1,000-hp. steam turbo-electric generating plant on the Tye River, and construction is under way on a new townsite. There is no connection between the Standard Soapstone Company and the Armstrong Products Corporation as reported in these columns under Norwood, Va., in the issue of Sept. 19. W. Wallace Benjamin is president and general manager of the Standard Soapstone Corporation.

CLARKSVILLE, VA. — The Roanoke River Power Company, Richmond, has made application for permission to construct and operate a hydro-electric power plant on the Roanoke River.

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer, United States Army, Washington, until Oct. 8, for electric supplies, including protector blocks, heat coils, indicator alarm fuses and mica fuses (Proposal C. P. 21,853-1).

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until Oct. 6, for 110 transmitting condensers (Schedule 4421); also, until Oct. 20, for a quantity of storage batteries for various yards (Schedule 4425).

North Central States

DETROIT, MICH.—Bids will be received by the Board of Water Commissioners until Oct. 13 for two motor-driven centrifugal pumping units, one a 70,000,000 gal. capacity per day unit, the other a 50,000,000 gal. capacity per day unit.

DETROIT, MICH.—The Municipal Power Bureau will soon begin superstructure work on its proposed electric generating plant, estimated to cost close to $12,000,000. Contract for building only has been awarded to the W. E. Wood Company, Detroit.

HOLLAND, MICH.—Bids will be received by the Sewage Commission of Holland until Oct. 21 for construction of intercepting sewer and sewage treatment plant, including pumping station, electrically driven vertical centrifugal pumps and chlorinating apparatus, etc. Pearse, Greeley & Hansen, 6 North Michigan Avenue, Chicago, are engineers.

JONESVILLE, MICH. — The Southern Michigan Light & Power Company, Hudson, is said to be planning the construction of a transmission line for local commercial service.

LANSING, MICH.—Plans have been filed by the Atlas Drop Forge Company for extensions in its power plant, including the installation of additional equipment.

MANCHESTER, MICH.—The Consumers Power Company, Jackson, has acquired the local municipal electric power plant.

COLUMBUS, OHIO.—Proposed boulevard lighting along the entire length of Broad and High Streets is estimated to cost $375,750.

HAMILTON, OHIO—Bids will be received by the Director of Public Service until Oct. 5 for the installation of an ornamental lighting system on High Street between Front Street and a point about 80 ft. west of the bridge.

PRINCETON, IND. — The Board of County Commissioners, Court House, plans the construction of an electric lighting plant in connection with two pumping stations for county service, estimated to cost $35,000. Harry E. Morrison is county engineer.

CHICAGO, ILL.—The Wisconsin Steel Works of the International Harvester Company, Torrence Avenue, plan the installation of electric power equipment in connection with three new mill additions, estimated to cost about $300,000.

CHICAGO, ILL.—The General Etching & Manufacturing Company, 312 South Hamilton Avenue, plans the installation of electric power equipment at its proposed plant at 3070-82 West Grand Avenue, to cost about $125,000. L. E. Russell, 25 North Dearborn Street, is architect.

ELGIN, ILL.—Permission has been granted the Western United Gas & Electric Company to erect a 33,000-volt transmission line between Elgin and Glen Ellyn.

BERLIN, WIS. — Work will soon be started by the Wisconsin Power & Light Company on a 23,000-volt, three-phase power-line extension from its Red Granite-Wautoma transmission line which will completely encircle Silver Lake.

BROOKLYN, WIS.—The Brooklyn Electric Company, which has been supplying electric service here from power purchased from the Belleville Electric Company for local distribution, has been taken over by the Southern Counties Power Company, which is a part of the Insull system in Wisconsin.

MADISON, WIS. — Arrangements have been completed by the Wisconsin Power & Light Company to build an 8-mile transmission line near De Forest to serve a large number of rural consumers.

MASON, WIS.—The White River Light & Power Company will extend its power lines to Drummond, and this action will be followed by additional extensions to Cable as far north as Benoit.

SUPERIOR, WIS.—Plans for an ornamental street-lighting system, from Twenty-first Avenue East to Twenty-third Avenue East has been approved.

DAVENPORT, IOWA.—The City Council has engaged Arthur L. Mullergren, Kansas City, consulting engineer, to assist in preparing plans, etc., for the proposed new ornamental lighting system.

BEMIDJI, MINN.—The State Board of Administration, Capitol Building, St. Paul, has authorized plans for a power plant at the local State Teachers' College, to cost about $100,000. C. H. Johnston, Capitol Bank Building, St. Paul, is architect.

MARSHALLTOWN, IOWA. — The Melbourne Electric Company, Melbourne, has made application for permission to extend its transmission lines in this district.

ADVANCE, MO.—The Missouri Power & Development Company, Willow Springs, is arranging for the installation of an improved street-lighting system.

HARTVILLE, MO.—The City Council plans the early purchase of equipment for its proposed municipal hydro-electric power plant. The Alexander Engineering Company, Woodruff Building, Springfield, Mo., is engineer.

KANSAS CITY, MO. — The Missouri Hydro-Electric Power Company, Joint Stock Land Bank Building, Kansas City, Mo., plans a 100-ft. power dam in Eleven Point River in Oregon and Howell Counties, Mo., and Randolph County, Ark.

POPLAR BLUFF, MO.—The International Rubber Company, 120 Broadway, New York, N. Y., contemplates the installation of electric power equipment in a projected local plant for cushion-tire production, estimated to cost $200,000.

CHAMBERLAIN, S. D. — The Dakota Public Service Company is planning the construction of a transmission line to serve a number of communities in this section.

GRAND ISLAND, NEB.—Bids will soon be asked by C. W. Burdick, Water and Light Commissioner, for the construction of a power plant, to be used in connection with waterworks expansion, estimated to cost $300,000. The Charles L. Pillsbury Company, Capital Bank Building, St. Paul, Minn., is engineer.

Southern States

HIGHLANDS, N. C.—The installation of a municipal electric plant is under consideration by the City Council.

RALEIGH, N. C.—The Carolina Power & Light Company contemplates extending its transmission lines from Raleigh to Garner, Raleigh to Crabtree Creek, Henderson to Norlina, Norlina to Warrenton and Warrenton to Littleton.

WARRENTON, N. C. — The Carolina Power & Light Company, Raleigh, N. C., is said to be planning extensions in its transmission system in this district.

CLINTON, S. C.—The Clinton Cotton Mills are completely electrifying their mill No. 2. Lockwood, Greene & Company, Atlanta, Ga., are engineers.

ELLENTON, S. C.—The Banana Casing Company plans the installation of electric power equipment at its proposed local veneer mills on a 50-acre tract of land, recently acquired, estimated to cost $125,000.

McCORMICK, S. C.—The Georgia-Carolina Power Company, Augusta, Ga., plans the early construction of a transmission line for local commercial service. The City Council will install a substation and distributing system.

PARR SHOALS, S. C.—The Broad River Power Company, Columbia, S. C., plans the early installation of a second unit at its local steam-operated electric power plant. The initial unit of 17,000 hp. capacity recently was completed.

SPARTANBURG, S. C.—A bond issue of $60,000 has been approved for the installation of a municipal electric light and power plant.

WALTERBORO, S. C. — The Colton Cypress Company plans the installation of electric power equipment in connection with the proposed rebuilding of the portion of its plant, recently destroyed by fire with loss estimated at $200,000.

COLUMBUS, GA.—The Columbus Electric & Power Company is arranging for an increase in capital of $2,500,000, a considerable portion of the proceeds to be used for expansion. The company has secured permission to issue stock in the amount of $4,071,000, the entire fund to be used in connection with its hydro-electric power development on the Chattahoochee River at Bartletts Ferry, including the construction of a steel-tower transmission line to Macon, Ga.

VERNA, FLA.—The Board of City Commissioners has completed plans for a municipal electric power plant, reported to cost about $30,000, and will proceed with work at an early date.

WEST PALM BEACH, FLA.—The City Council has granted the Florida Light & Power Company a franchise to furnish electricity here.

ERWIN, TENN.—The Carolina, Clinchfield & Ohio Railway Company, Johnson City, Tenn., plans the installation of electric power equipment in connection with extensions and improvements in its local car and locomotive repair shops, to cost about $275,000.

JACKSON, TENN. — Bids will be received by J. G. Neudorfer, Commissioner of Public Utilities, until Oct. 15 for equipment for a proposed street-lighting system, as per specifications on file.

PETERSBURG, TENN. — The Southern Cities Utilities Company, Chattanooga, is planning to build a steam-driven electric plant for service in the southwestern portion of the state. Extensions will be made in transmission lines.

TREZEVANT, TENN.—The Town Board is negotiating with the Kentucky-Tennessee Light & Power Company, Bowling Green, for the installation of a new lighting system for the town and also to furnish power for pumping water for the new water plant from its plant in Martin.

TULLAHOMA, TENN.—The Campbell-Dana Hardwood Company plans the installation of electric power equipment in connection with the proposed rebuilding of the portion of its mill, recently destroyed by fire with loss estimated at $350,000.

ALBANY, ALA.—The Alabama Power Company, Birmingham, has tentative plans for a one-story substation on local site, estimated to cost $21,000.

GADSDEN, ALA.—The City Council has approved plans for an improved street-lighting system in the business district and will proceed with work at an early date.

FLORENCE, ALA.—Plans for rebuilding the lumber mill of the Sparrow Lumber Company include a power plant.

CONWAY, ARK.—The purchase of two oil-burning generating units, one of 240 hp. and the other of 300 hp., for the municipal electric plant is under consideration.

LITTLE ROCK, ARK. — The Ozarks Hydro-Electric Power Company is being organized as an interest of the North American Company, with capital of $300,000. Plans are under way for the acquisition of the hydro-electric power plant of the Dixie Power Company in the vicinity of Cotter, Ark.

LOCKESBURG, ARK. — The Duncan Lumber Company plans the installation of electric power equipment in connection with the proposed rebuilding of its planing mill, recently destroyed by fire, with loss estimated at $200,000.

SILOAM SPRINGS, ARK. — Plans are under consideration by the City Council for a municipal electric light and power plant.

WALNUT RIDGE, ARK.—The Arkansas-Missouri Power Company has plans under way for the rebuilding of its local power plant, partially destroyed by fire Sept. 7, with loss estimated at $350,000.

HAYNESVILLE, LA. — The Arkansas Power & Light Company, Pine Bluff, Ark., is reported to be planning the construction of a transmission line in this district. The company recently acquired the plant and system of the Haynesville Light & Power Company.

SHREVEPORT, LA.—The Morgan Companies, S. R. Morgan, president, will install electric power equipment in all departments of their proposed local ice-manufacturing plant, estimated to cost $180,000.

SHREVEPORT, LA. — The Texas & Pacific Railway Company, Dallas, Tex., will proceed with the construction of a power plant at its proposed local repair shops, estimated to cost $125,000.

HANNA, OKLA.—The Oklahoma Power Company, Okmulgee, will proceed with the construction of a transmission line from Dustin, Okla., for local commercial service. A substation will be installed.

TONKAWA, OKLA.—The City Council has engaged the Ruckel Engineering Company, Arkansas City, Kan., engineer, to prepare plans for a proposed municipal electric light and power plant, to cost about $140,000.

TULSA, OKLA. — The Public Service Company of Oklahoma is constructing a 33,000-volt, 55-mile transmission line from Tulsa to Nowata. The company is also constructing a new switching and transformer station in northeast Tulsa.

WELLSTON, OKLA.—The erection of an electric transmission line from Chandler to Wellston and installing an electric distribution system in Wellston, to cost about $25,000, is under consideration. R. K. Johnson, Chandler, is engineer.

AMARILLO, TEX.—The Board of City Development has engaged General George W. Goethals, New York, to make a survey with a view of constructing an electric power plant in the natural-gas field in the Panhandle north of here.

AMARILLO, TEX.—A permit has been granted the Southwestern Public Service Company, Roswell, N. M., to do business in Texas. The company plans to construct electric plants and erect transmission lines in northwestern Texas. The Texas headquarters of the company are in Amarillo.

ARCHER CITY, TEX. — The Wichita Falls Electric Company, Wichita Falls, Tex., has authorized the construction of a transmission line for local commercial service. The company has recently acquired the municipal power plant and will discontinue operations.

ARLINGTON, TEX.—The City Commission has completed plans for the construction of a municipal electric light and power plant to cost $89,500, in which amount bonds have been voted.

BRYAN, TEX. — The Western Public Service Company, Calvert, Tex., has tendered a proposition for the purchase of the municipal electric light and power plant, and plans the construction of a transmission line for local service.

CHILDRESS, TEX.—The Central Texas Power Company plans the construction of an electrically-operated ice-manufacturing plant on a local site, to cost about $100,000.

LULING, TEX.—The United North & South Oil Company, Inc., has plans for the complete electrification of its properties on both sides of the San Marcos River, Luling oil fields, and will install new equipment to replace present gas-driven apparatus. The construction of a steam-operated electric power plant is under advisement. The entire project will cost more than $175,000.

SABINAL, TEX.—The Southwest Utility Company has been incorporated here with a capital stock of $75,000. J. A. Smylie, manager of the Sabinal Utility Company, and Jordan T. Lawlor of Bryan, Texas, are the principal owners of the new company. It is constructing an electric light and power plant at Castorville, and another will be constructed at Knippa.

Pacific and Mountain States

AUBURN, WASH.—The City Council has secured permission to use water from Coal Spring Creek, a tributary of the Stuck River, in King County, for a proposed municipal hydro-electric power development, estimated to cost $200,000. Plans will soon be drawn.

BELLINGHAM, WASH. — The Westminster Paper Mills Company plans to install electric power equipment at its proposed mill at Army and Chestnut Streets, to cost about $300,000.

WENATCHEE, WASH. — The Chelan Electric Company, Chelan, has tentative plans for the construction of a hydro-elec-

tric power plant at the mouth of the Chelan River, near this place, with initial capacity of 50,000 hp. Application for permission has been made.

BOLINAS, CAL.—The Pacific Gas & Electric Company, San Francisco, plans the construction of a transmission line in this district for service at Olema, Reyes Station and Nicasio Valley. It will operate at 60,000 volts.

COMPTON, CAL.—The Board of City Trustees will soon perfect plans for the installation of an ornamental lighting system on Bradfield and Holly Avenues, using concrete standards.

GLENDALE, CAL.—The Board of City Trustees has adopted a resolution providing for the installation of an ornamental lighting system on portions of Maryland Avenue, California Avenue, Wilson Avenue, Broadway, Kenwood Street, Doran Street and Lexington Drive, using single lamp standards.

INGLEWOOD, CAL.—The Board of City Trustees is considering a petition for the installation of an ornamental lighting system on the Hyde Park and Centinela Boulevards, requiring about 2,000 standards.

LOS ANGELES, CAL.—The installation of ornamental lamps on Manhattan Place is under consideration by the City Council.

PASADENA, CAL.—The installation of automatic safety traffic control signals in the business section of the city is under consideration by the city officials.

SAN FRANCISCO, CAL.—The El Dorado Power Company, care of Chickering & Gregory, Merchants' Exchange Building, has applied for permission to use water from Silver Fork, El Dorado County, for a proposed hydro-electric power development.

SAN FRANCISCO, CAL.—The Feather River Power Company, Hobart Building, has applied for permission to use water from the Middle Fork of the Feather River, Plumas County, for a proposed hydro-electric power development to cost $1,300,000.

SAN LEANDRO, CAL.—The Board of City Trustees is considering the installation of a municipal electric fire-alarm system. J. J. Gill is city clerk.

PHOENIX, ARIZ.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 12, for remodeling the electric passenger elevator in the United States post office and court house, Phoenix. For details see Searchlight Section.

Canada

VANCOUVER, B. C.—The British Columbia Electric Railway Company has authorized plans for a hydro-electric power development on the Bridge River, to cost about $10,000,000, with transmission system. The initial unit will have a capacity of 60,000 hp.

DRUMMONDVILLE, QUE.—The Southern Canada Power Company, Montreal, has applied to the Public Service Commission for permission to erect a 13,000-volt transmission line to connect up a number of villages in the Cowansville district.

Electrical Patents

Announced by U. S. Patent Office

(Issued September 1, 1925)

1,552,346. ELECTRIC COUPLING; W. A. Riley, New York, N. Y. App. filed Dec. 27, 1924. For connection and disconnection.

1,552,349. ELECTRIC LIGHT APPARATUS; W. D'A. Ryan, Schenectady, N. Y. App. filed Feb. 20, 1923. Arc lamp having a plurality of anodes.

1,552,360. COMPENSATED ALTERNATING-CURRENT COMMUTATOR MOTOR WITH REVERSIBLE DIRECTION OF ROTATION; H. Trauernicht, Kiel-Gardens, Germany. App. filed Oct. 6, 1924.

1,552,369. INCLOSED ARC WELDING DEVICE; J. W. White, Detroit, Mich. App. filed Jan. 5, 1921.

1,552,375. TIME-LIMIT DEVICE; C. D. Ainsworth, Wollaston, Mass. App. filed Jan. 8, 1921.

1,552,383. VENTILATION OF DYNAMO-ELECTRIC MACHINES; F. T. Hague, Pittsburgh, Pa. App. filed July 14, 1923.

1,552,384, 1,552,385, 1,552,386. ASYNCHRONOUS MOTOR; C. MacMillan, Schenectady, N. Y. App. filed April 12, 1924.

1,552,387. ELECTRICAL HEATING UNIT; J. R. Marchesseault, Cranston, R. I. App. filed Feb. 24, 1925. Unit employed in connection with cooking vessels.

(Issued September 8, 1925)

1,552,417. ELECTRIC SWITCH; G. A. Burnham, Saugus, Mass. App. filed March 22, 1921. Double-tank oil type.

1,552,418. ELECTRICAL WELDING METHOD AND APPARATUS; A. Churchward, New York, N. Y. App. filed April 22, 1919.

1,552,424. WIRE CONNECTOR; E. A. Everett, New York, N. Y. App. filed Jan. 14, 1924.

1,552,425. ADJUSTABLE RESISTANCE UNIT; E. A. Everett, Long Island City, N. Y. App. filed Oct. 16, 1924.

1,552,427. THEATER SWITCHBOARD; H. J. Frank, Detroit, Mich. App. filed Oct. 26, 1921.

1,552,443. WELDING ALUMINUM; R. D. Mershon, New York, N. Y., and P. A. Ross, Yonkers, N. Y. App. filed July 21, 1923.

1,552,446. ELECTRICAL CONTROL APPARATUS; G. R. Radley, Milwaukee, Wis. App. filed Aug. 21, 1919. For farm-lighting systems.

1,552,465, 1,552,466, 1,552,467. MEANS AND METHOD FOR MEASURING DIRECT CAPACITIES; G. A. Campbell, Upper Montclair, N. J. App. filed July 14, 1923.

1,522,470. MEANS FOR MEASURING TELEGRAPH DISTORTION; S. I. Cory, Elmhurst, N. Y. App. filed Sept. 26, 1924.

1,552,476. SAFETY WELDING TONGS; R. W. Erickson, Jersey City, N. J. App. filed Aug. 9, 1924.

1,552,499. MEANS FOR MEASURING TELEGRAPH DISTORTION; H. Nyquist, Elmhurst, N. Y. App. filed April 2, 1923.

1,552,521. ELECTRIC COUPLER; H. E. Van Dorn and J. McW. Stone, Chicago, Ill. App. filed May 23, 1923. For railway cars.

1,552,561. SWITCH; E. H. Jacobs, Chicago, Ill. App. filed May 6, 1921. Large air-break switches.

1,522,566. TAKE-UP REEL; O. Norden, Chicago, Ill. App. filed Feb. 18, 1924.

1,552,589. CENTRIFUGAL ELECTRIC SWITCH; H. E. White, Montclair, N J. App. filed Nov. 15, 1919. For single-phase induction motor.

1,552,591. METAL-PLATING DEVICE; P. J. Batenburg, Racine, Wis. App. filed May 14, 1923.

1,552,606. ELECTRON DISCHARGE DEVICE; G. Holst and E. Oosterhuis, Eindhoven, Netherlands. App. filed Nov. 4, 1921.

1,552,609, 1,552,610. NICKEL ANODE AND METHOD OF PRODUCING THE SAME, ETC.; N. V. Hybinette, Wilmington, Del. Apps. filed June 3, 1922, and Sept. 23, 1922.

1,552,619. ELECTRODE HOLDER; B. G. Klugh, Chicago, Ill. App. filed March 25, 1922. For electric furnaces.

1,552,624. AUTOMATIC TELEPHONE SYSTEM; C. E. Lomax, Chicago, Ill. App. filed March 25, 1921.

1,552,654. LAMP FIXTURE; A. J. Thompson, Cleveland, Ohio. App. filed July 6, 1920. Lamp hanger.

1,552,663. INSULATOR CAP; A. O. Austin, Barberton, Ohio. App. filed April 7, 1921. For insulators of the suspension type.

1,552,664. INSULATOR; A. O. Austin, Barberton, Ohio. App. filed June 9, 1921. For high potentials.

1,552,670. RADIO TRANSMITTING SYSTEM; G. Belfils, Belfort, France. App. filed Aug. 29, 1921.

1,552,676. ELECTROMAGNETIC APPARATUS; R. E. Carpenter and F. G. Creed, Croydon, England. App. filed Sept. 1, 1921.

1,552,679. PHOTOMETRIC DEVICE; V. C. Crites, Chicago, Ill. App. filed Jan. 9, 1920. With means for the amplification of variations.

1,552,701. STREET-LIGHTING SYSTEM; S. B. Hood, Minneapolis, Minn. App. filed Aug. 20, 1924.

1,552,709. TELEPHONE SYSTEM; L. D. Kellogg, Chicago, Ill. App. filed June 29, 1918. Automatic selecting system.

1,552,767. COMBINED CONVECTION AND RADIANT HEATER; M. H. Shoenberg and L. Schon, San Francisco, Cal. App. filed April 30, 1924.

1,552,776. TELEPHONE AMPLIFIER; L. A. Tilden and C. Knudson, Rexford, Kan. App. filed March 5, 1921.

1,552,781. ARRANGEMENT FOR CONTROLLING THE DRIVING MOTORS IN HIGH-FREQUENCY MACHINES; G. G. von Arco, Berlin, Germany. App. filed Dec. 7, 1923.

1,552,812. ELECTROLYTIC CELL; W. G. Allan, Toronto, Ontario, Canada. App. filed Oct. 5, 1920. Adapted for generation of oxygen and hydrogen from an aqueous electrolyte.

1,552,813. ELECTRIC HOUSEHOLD IRON; G. Amman, Cincinnati, Ohio. App. filed Jan. 12, 1923.

1,552,816. TRAFFIC SIGNAL; H. Bledsoe, Terre Haute, Ind. App. filed Jan. 29, 1925.

1,552,829. RADIO RECEIVING SYSTEM; H. de R. de Bellescize, Toulon, France. App. filed Aug. 29, 1921.

1,552,835. MULTIPLE-FILAMENT LAMP; F. P. Foulk, Indianapolis, Ind. App. filed Oct. 18, 1920.

1,552,843. POLICE SIGNAL SYSTEM; W. W. Kideney, Chicago, Ill. App. filed Nov. 3, 1919.

1,552,865. PROCESS FOR MELTING LIGHT METALS AND ALLOYS THEREOF IN ELECTRICAL INDUCTION FURNACES; T. Metzger, Dusseldorf-Gerresheim, Germany. App. filed April 22, 1924.

1,552,911. SWITCH BOX; G. H. Calhoun, Mansfield, Ohio. App. filed May 19, 1923. For installation in a building.

1,552,915. LIGHTING FIXTURE; O. Dyson, Bryn Mawr, Pa. App. filed July 3, 1924. Ceiling fixture or dome light.

1,552,917. ELECTRIC LAMP SOCKET; F. A. Faulhaber, Jr., East Orange, N. J. A p. filed Sept. 11, 1924.

1,552,919. ELECTRICAL COMMUNICATING SYSTEM; C. R. Gauthier, New York. N. Y. App. filed Nov. 22, 1919. Telephone and telegraph system.

1,552,926. PHOTO-ELECTRIC MEANS FOR REPRODUCING SOUND FROM GRAPHICAL RECORDS; R. Hart, Los Angeles, Cal. App. filed Nov. 1, 1924.

1,552,931. FIRE ALARM; S. Karashik, Brooklyn, N. Y. App. filed April 11, 1923.

1,552,932. GROUNDING DEVICE FOR ELECTRICAL CONDUITS; C. L. Kessler, San Diego, Cal. App. filed Nov. 18, 1922.

1,552,938. AGITATING MEANS FOR ELECTRO-DEPOSITING APPARATUS; W. W. McCord, Wyandotte, Mich. App. filed May 16, 1924.

1,552,952. ANODE; H. G. Rice, Waterbury, Conn. App. filed May 22, 1924. For supplying metal to a plating bath.

1,552,957. INDIRECT ILLUMINATION; L. Roth, New York, N. Y. App. filed March 13, 1922.

1,552,970. SYSTEM OF ELECTRICAL REGULATION; W. A. Turbayne, Niagara Falls, N. Y. App. filed June 29, 1914. Of variable speed generators.

1,552,971. ELECTRIC FUSE; F. C. Unger, St. Louis, Mo. App. filed Dec. 16, 1921. With protected contacts.

1,552,993. ELECTRIC SWITCH CONTACT; H. E. Leppert, New Britain, Conn. App. filed Jan. 13, 1923.

1,553,026. ELECTRIC HEATING UNIT OR ELEMENT; A. Brown, Gore, Otago, New Zealand. App. filed July 25, 1922. For maintaining the working temperature of internal-combustion engines.

1,553,030. COMBINATION PLUG AND SOCKET; D. Carl, New York, N. Y. App. filed Jan. 6, 1922.

1,553,039. CIRCUIT CONTROLLER FOR HEATING ELEMENTS; E. E. Gray, Los Angeles, Cal. App. filed Oct. 21, 1922.

1,553,064. CABLE-SUPPORTING DEVICE; J. Blash, Brooklyn, N. Y. App. filed Feb. 15, 1923.

1,553,069. ELECTROMAGNETIC DEVICE; M. Crémer, Paris, France. App. filed March 23, 1922. For motor starting.

1,553,080. AUTOMATIC STRIPPING MACHINE; C. H. Hill, Perth Amboy, N. J. App. filed Nov. 25, 1921. For treating starting sheets or cathode blanks used in certain electrolytic processes.

1,553,094. ELECTRICAL BLOWTORCH; J. Moldovan, Wheeling, W. Va. App. filed May 3, 1924.

1,553,098. METHOD AND APPARATUS FOR PURIFYING AIR; F. L. Napier, St. Joseph, Mich. App. filed Feb. 25, 1924.

1,553,102. ELECTRICAL CONNECTOR; H. D. Pierce, Hamburg, N. Y. App. filed Oct. 4, 1922.

1,553,104. SYSTEM OF ELECTRIC DISTRIBUTION; A. A. Pollock, Leamington Spa, England. App. filed Dec. 10, 1923.

1,553,135. ELECTROCUTTING APPARATUS; T. J. Byrnes, Omaha, Neb. App. filed Feb. 7, 1921. For executing animals.

1,553,148. ATTACHMENT PLUG; J. P. Donahue, Chicago, Ill. App. filed April 15, 1922.

1,553,152. METHOD AND APPARATUS FOR GENERATING ELECTRICAL OSCILLATIONS; R. A. Fessenden, Chestnut Hill, Mass. App. filed Nov. 10, 1920.

Financial and Corporate

Utility Stocks Irregular

Investors Show Spirit of Caution as General Market Wavers—No Definite Trend

THE hesitation that characterized trading on the New York Stock Exchange at different times during the week in industrial and railroad issues had a quieting effect upon the trading in power and light shares. Money rates continue generally easy, but traders in some quarters are inclined to believe that, with the market at its present high levels, nothing will be lost by holding off for a time on further purchases. Business continues good, however, and every indication is that greater and greater values are being added to the majority of sound utility issues.

In the week under review the price movement was just a little confused. Net changes revealed advances and declines in about equal number. The outstanding feature of the market was, indeed, the fact that utility stocks established no definite trend. Southern California Edison Company's shares continued strong, it is true, and added more than eight points to their position of the week before as investment interest in this utility spread. Southeastern Power & Light Company's stock, on the other hand, which had been one of the strongest issues in the forward movement, lost ground as the company began its distribution of new stock. The distribution caused a certain amount of selling.

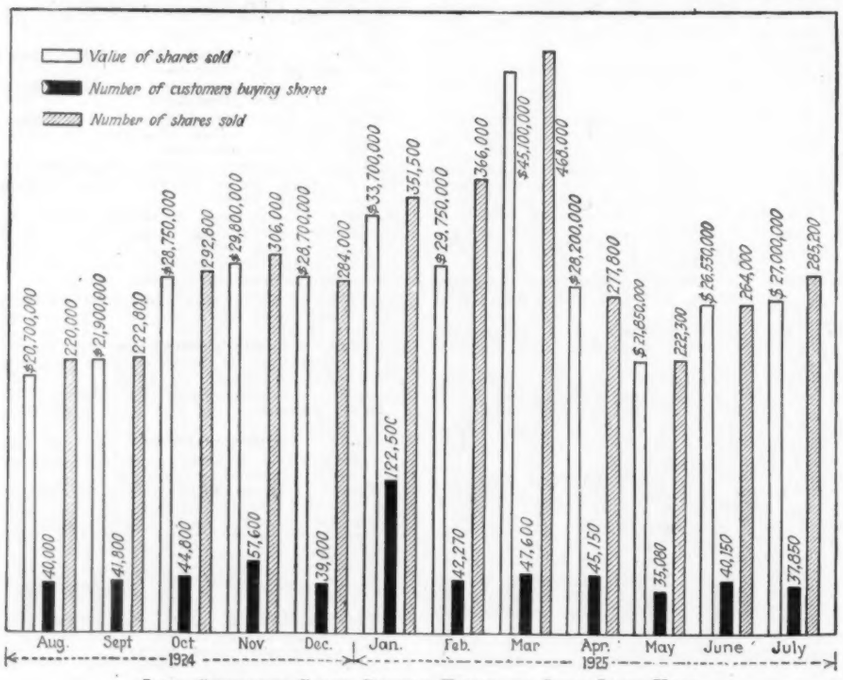
Perhaps the most spectacular advance of the week was in one of the high-priced issues, National Power & Light, that issue having improved its position by something like seventeen points. Rumors of a split-up, revived periodically in Wall Street, accompanied this rise in National and a five-point rise in the shares of the Carolina Power & Light Company. Columbia Railway, Power & Light was strong, and Commonwealth Edison moved forward five points. Losses were sustained by Electric Bond & Share, Electric Investors, American Water Works & Electric and Lehigh Power Securities.

July Customer Sales Total $27,000,000

Based upon monthly reports received by the ELECTRICAL WORLD from electric light and power companies selling stock direct to customers and employees, it is estimated that during July a total of 285,200 shares were sold in this manner.

The total value of the stock sold is estimated at $27,000,000, which is pretty nearly double the sales reported for July last year—$14,000,000. A total of 37,850 customers participated in the sales against 25,900 in July, 1924. The average sale to each customer in July of this year was $714, as compared with $572 for the same month of the preceding year.

The total sales of stock by electric light and power companies direct to customers during the present year were $212,130,000.



JULY CUSTOMER SALES DOUBLE THOSE OF JULY LAST YEAR

Dividends Declared

The quarterly dividends listed below were announced during the past week by electric light and power and electric manufacturing companies:

Name of Company	Per Cent	When Payable
Abitibi Power & Paper, pf.	1¾	Oct. 1
Associated Gas & Electric, pf. $7 div. series	$1.75*	Oct. 1
Binghamton Lt., Ht. & Pwr., 7% pf.	1¾	Oct. 1
Binghamton Lt., Ht. & Pwr., 6% pf.	1½	Oct. 1
Buffalo General Electric	.40	Sept. 30
California Electric Generating, pf.	1½	Oct. 1
Central Power, pf.	1¾	Oct. 15
Century Electric, com.	1½	Sept. 22
Century Electric, pf.	1¾	Oct. 1
Chickasha Gas & Electric, pf.	1¾	Sept. 30
Chickasha Gas & Electric, com.	1	Sept. 30
Cincinnati Gas & Electric	1¼	Oct. 1
Columbia Ry., Gas & Elec., pf.	1¾	Oct. 1
Columbus Ry., Pwr. & Lt., 1st pf.	1¾	Oct. 1
Commonwealth Pwr., pf.	$1.50	Nov. 2
Commonwealth Power, new com.	.40	Nov. 2
Consolidated Gas, Electric Light & Power, Baltimore, com.	.62½	Jan. 2'26
Dayton Power & Light, com.	.12	Oct. 1
Dayton Power & Light, pf.†	.50	Oct. 1
Dominion Pwr. & Transmission, pf.	1¾	Oct. 15
Edison Electric (Lancaster)	3	Sept. 30
Electric Vacuum Cleaner, com.	$1	Oct. 1
Electric Vacuum Cleaner, pf.	1¾	Oct. 1
Elmira Water, Lt. & RR., com.	1½	Sept. 30
Elmira Water, Lt. & RR., 1st pf.	1¾	Sept. 30
Elmira Water, Lt. & RR., 2nd pf.	1¾	Sept. 30
Fall River Electric Light	.50	Oct. 1
Florida Public Service, pf.	1¾	Oct. 1
Georgia Lt., Pwr. & Rys., pf.	1¾	Oct. 1
Greenfield Elec. Lt. & Pwr., com.	$2.50	Sept. 30
Greenfield Elec. Lt. & Pwr., pf.	.37	Sept. 30
Greenfield Electric Light & Power, employees' stock	.25	Sept. 30
Harrisburg Light & Power, com.	2½	Sept. 30
Harrisburg Light & Power, pf.	1¾	Sept. 30
Johns-Manville	.75	Oct. 1
Metropolitan Edison, pf. B.	$1.75	Oct. 1
Metropolitan Edison, pf. C.	$1.50	Oct. 1
Nevada-California Electric, pf.	1¾	Nov. 2
New Jersey Power & Light, pf.	1¾	Oct. 1
New Orleans Public Service, pf.	1¾	Oct. 15
Ohio Brass, class B	$1	Oct. 15
Ohio Brass, pf.	1¾	Oct. 15
Ottawa-Montreal Power, pf.	1¾	Oct. 1
Parr Shoals Power, pf.	1¾	Oct. 1
Philadelphia Co., com.	$1	Oct. 31
Philadelphia Co., 6% pf.	$1.50	Nov. 2
Pittsburgh Utilities, com.	$1	Nov. 2
Pittsburgh Utilities, com. (extra)	.....	Nov. 2
Pittsburgh Utilities, pf.	.35	Nov. 2
Pittsburgh Utilities, pf. (extra)	.25	Nov. 2
Public Service Co. of Oklahoma, pr. In. stk.	1¾	Sept. 30
Public Service Co. of Oklahoma, pf.	1¾	Sept. 30
Public Service Co. of Okla., com.	2	Sept. 30
Public Service Elec. Pwr., pf.	$1.75	Nov. 2
Quebec Power, com.	1¼	Oct. 15
Quebec Power, pf.	1¾	Oct. 15
San Diego Con. Gas & Elec., pf.	1¾	Oct. 15
Sayre Electric, pf.	1¾	Oct. 1
Tenn. Electric Power, 6% 1st pf.	1½	Jan. 1'26
Tenn. Electric Power, 7% 1st pf.	1¾	Jan. 1'26
Tenn. Electric Power, 7.2% 1st pf.	$1.80	Jan. 1'26
Tenn. Electric Power, 6% 2d pf.	$1.50	Nov. 1
Tenn. Electric Power, 6% 1st pf.†	.50	Nov. 1
Tenn. Electric Power, 6% 1st pf.†	.50	Dec. 1
Tenn. Electric Power, 6% 1st pf.†	.50	Jan. 1'26
Tenn. Electric Power, 7.2% 1st pf.†	.60	Nov. 1
Tenn. Electric Power, 7.2% 1st pf.†	.60	Dec. 1
Tenn. Electric Power, 7.2% 1st pf.†	.60	Jan. 1'26
West Kootenay Power & Light, pf.	1¾	Oct. 1
Western Power Corp., pf.	1¾	Oct. 15
Worcester Electric Light	$1	Sept. 30

*Payable in cash or class A stock. †Monthly.

American Bosch Magneto Corporation to Increase Capital Stock.—The stockholders of the American Bosch Magneto Corporation will vote October 13 on increasing the authorized capital stock from 175,000 shares to 250,000 shares of common stock of no par value. The corporation is planning to issue 69,133 shares of additional stock at $33 a share in the ratio of one new share for two old. The proceeds are to be used to retire an 8 per cent note issue.

Details of New Insull Holding Company

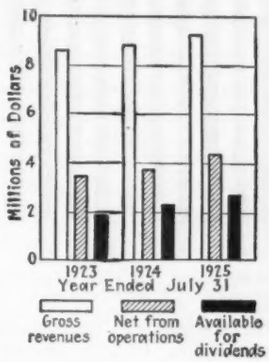
New England Public Service Company, Organized Recently by Middle West Utilities, Will Take Over Electric Properties with $9,289,000 Gross Business

BY PAUL WILLARD GARRETT

THE New England Public Service Company, the new utility holding company that has been formed by the Middle West Utilities Company to control various properties in the New England section, does a gross business of $9,289,000. Upon completion of the present financing it will own virtually all of the common stocks of the Central Maine Power Company and the Manchester Traction, Light & Power Company and a substantial majority of the common stock of the National Light, Heat & Power Company. Through National it will also control the Twin State Gas & Electric Company, the Berwick & Salmon Falls Electric Company, the Vermont Hydro-Electric Corporation, Inc., the Rutland Railway, Light & Power Company and the Pittsford Power Company.

The operating properties of the new holding company serve at retail a total of 286 industrial and farming communities that have a combined population of approximately 600,000 in Maine, New Hampshire, Vermont and New York. In addition eighty communities are served at wholesale. While the company controls a large part of the water-power resources of New England, the ultimate capacity of undeveloped water power is estimated to be about twice that now developed. Subsidiaries of the New England Public Service Company have a present generating capacity of 108,000 kw., of which 66 per cent is hydroelectric. Work is going on at present for the addition of 20,000 kw. power on the Androscoggin River.

Whether or not bonds will be issued and sold by the New England Public Service Company has not been announced, but the capitalization of the company at present does not include any funded debt. An offering has just been made of 80,000 shares of prior-lien preferred stock, and it is expected that in the near future another offering will be made to the public of 40,000 shares of seven-dollar dividend series preferred stock. Upon completion of the financing now contemplated or completed the New England Public Service Company will have three classes of its own securities outstanding as follows:



GROSS EARNINGS OF OPERATING UNITS OF NEW HOLDING COMPANY SINCE 1923

80,000 shares of cumulative prior-lien preferred stock, 40,000 shares of seven-dollar dividend series preferred stock and 181,600 shares of common stock.

Consolidated gross earnings of the company for the year ended July 31 show improvement and reveal that the revenue of the operating units has grown from $8,599,932 in 1923 to $9,289,000 in 1925. Although operating revenue thus has increased substantially in the last three years, gross operating expense in the same period has been reduced from $5,153,491 in 1923 to $4,897,923 in 1925, so that net earnings from operation for the period were raised from $3,446,441 to $4,391,072. With net earnings from operation of $4,391,072 for the year ended July 31, 1925, and other income of $205,276, gross income for the period equaled $4,596,348. Interest on the company's funded debt and other fixed charges aggregated $1,909,191, so that the total net income available for dividends was $2,687,157. The preferred dividends and the proportion of undistributed net income applicable to the common stocks of subsidiaries owned took $1,064,108, leaving a balance for reserves and for stocks owned by the New England Public Service Company of $1,623,049. Since annual dividend requirements on the 80,000 shares of prior-lien preferred stock are $560,000, it may be seen that the company in that year earned $20.29 a share on this stock, or 2.89 times dividend requirements.

New Financial Issues in September Meager

Electric Light and Power Companies Put Out Securities Amounting to $41,985,000, Lowest Total of Year

DURING the month of September new offerings of stocks, bonds and notes of the central-station companies of the country aggregated only $41,985,000, the smallest monthly total recorded since the beginning of the year. Though a consistent decline in monthly totals has been in evidence since early summer, the nine-month period closes with a figure that compares favorably with that recorded for the same period of 1924—$769,042,010 against $719,310,700.

Attention is again called to the prominent part taken by preferred stock in the month's new flotations. The largest individual piece of financing was in the form of an issue of prior-lien preferred stock of the Central & South West Utilities Company, involving a total of $9,850,000, the price being 98¼ a share. The average yield, which has been on the upgrade during the past few months, took a sharp upward turn in September to the 6.63 per cent mark. Long-term financing predominated.

SECURITY ISSUES OF ELECTRIC SERVICE COMPANIES IN SEPTEMBER

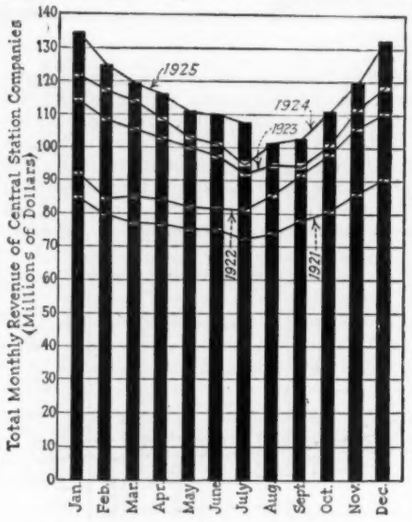
Name of Company	Amount of Issue	Period Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
Penn Gas & Electric Co.	$700,000	..	Cumulative preferred stock		7	98½	7.10
	1,350,000	30	First lien and refunding mortgage gold bonds, series A, sinking fund		5½	97	5.70
General Power & Light Co.	900,000	1	Mortgage lien gold notes	To pay in part for acquisition of properties and securities	6	100	6
Shenandoah River Power Co. (Va.)	410,000	20	First mortgage gold bonds	To pay for acquisition of properties	6	97	6.35
Central & South West Utilities Co. (Del.)	9,850,000	..	Prior lien preferred stock	Acquisition of properties, to provide working capital and for other corporate purposes	7	98½	7.11
	6,240,000	..	Preferred stock	To acquire securities of other utilities	7	96	7.29
American Power & Light Co. (Me.)	5,000,000	92	Gold debenture bonds, American series	Working capital and for other corporate purposes	6	96	6.25
American Superpower Corp. (Del.)	2,880,000	..	First preferred stock	Acquisition of additional interests in other utilities	6	96	6.25
Buffalo, Niagara & Eastern Power Corp.	2,000,000	5	Convertible debenture bonds	Working capital and other corporate purposes	5	100	5
Eastern Minnesota Power Co.	315,000	20	First mortgage gold bonds, series A	To retire company obligation	5½	100	5.50
Northwestern Light & Power Co. (Ia.)	500,000	25	First and refunding mortgage gold bonds, series B	To retire existing indebtedness, to pay for properties recently acquired and for other corporate purposes	6	98½	6.10
New England Public Service Co.	7,840,000	..	Prior lien preferred stock	To acquire stock of other utilities	7	98	7.14
Iowa Railway & Light Corp.	4,000,000	20	First and refunding mortgage gold bonds	Acquisition of new properties	5½	99	5.58
Total	$41,985,000						

Detroit Edison to Issue Stock to Finance Construction Program.—The board of directors of the Detroit Edison Company announces that an offering of additional stock will be made to stockholders of record September 21 and that the subscriptions will be payable in full on October 22, or in four equal installments, payable October 22, 1925, December 22, 1925, March 22, 1926, and June 2, 1926. Each stockholder will be entitled to subscribe at par for an amount equal to 10 per cent of the par value of the stock then held by him—that is to say, at the rate of one new share for each ten shares of his holdings on September 21. The total issue will be equal to 10 per cent of the capital stock outstanding on September 21. In a letter to stockholders Alex Dow, president, says: "The increase in your company's business during the year 1925 and the prospects of continued increase have justified us in continuing the preparations referred to in our annual report dated January 14."

Western Electric to Pay 50 per Cent Dividend.—The Western Electric Company has filed at Albany a notice of an increase in stock capitalization from 500,000 no-par-value common shares to 1,000,000 authorized. Of the new stock 250,000 shares will be made outstanding in the form of a stock dividend, which thus amounts to 50 per cent.

Central-Station Revenue 14.1 per Cent Over Last Year

Reports received by the ELECTRICAL WORLD from central-station systems representing 77 per cent of the total



GROSS REVENUE TOTALED $108,800,000 DURING THE MONTH OF JULY

generator rating of the industry indicate that the total gross revenue from the sale of energy during the month of July was $108,800,000, an increase of $13,500,000, or 14.1 per cent, over the same period for 1924. The operating and maintenance expenses total $52,500,000.

Company Reports

The following statements of earnings were issued during the past week by electric light and power companies for the month of August:

Name of Company	Gross Earnings for August 1925	1924
Alabama Power	$1,082,929	$734,598
American Power & Light	3,963,208	3,363,222
American Water Wks. & Elec.	3,322,257	2,999,228
Bangor Hydro Electric	131,329	123,141
Central Illinois Light	285,495	250,633
Columbia Gas & Electric	2,477,202	1,440,082
Commonwealth Power	3,355,779	2,907,155
Consumers Power	1,575,055	1,372,934
Cumberland Co. Pwr. & Lt.*	292,827	317,129
Georgia Railway & Power	1,258,681	1,360,383
Grafton County El. Lt. & Pwr.	16,293	15,808
Great Western Power	668,925	639,315
Houghton County Elec. Light	34,679	35,454
Nevada-California Electric	385,082	351,008
New Bedford Gas & Edison Lt.	298,345	273,792
Newport News & Hampton Railway, Gas & Electric	190,947	188,451
Northern Ohio Power	927,178	801,689
Ohio Edison	107,992	103,675
Philadelphia Company	4,350,076	4,045,115
Portland Electric Power	859,162	839,852
Public Service Corp. of N. J.	7,343,642	6,566,923
Republic Railway & Light	864,317	796,788
Southern California Edison	2,299,550	1,704,189
Southern Indiana Gas & Elec.	207,161	199,471
Tennessee Electric Power	896,569	744,692
United Gas & Electric	1,078,088	975,199
Washington Water Power	513,706	440,111
West Penn Co.	2,012,728	1,906,377

* July.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

STOCKS

Companies	Bid Price Saturday, Sept. 26	Low 1925	High 1925
Abitibi Pwr. & Paper, com.—no par	f 67¼	62	75¼
Adirondack Pwr. & Lt.—7% pf.	101	98	106
Adirondack Pwr. & Lt.—8% pf.	108	103	115
Adirondack Pwr. & Lt., com.—50.	70	31	98
Ala. Pwr., pf.	103	97½	103
Allis-Chalmers Mfg. pf.	10	103½	108½
Allis-Chalmers Mfg., com.	f 88	71	91
Amer. & Foreign Pwr., pf. 25% pd.	137	114½	142
Amer. & Foreign Pwr., 7% pf.	f 91	87	94
Amer. & Foreign Pwr., com.	f 47¾	27½	5
Amer. Bosch Magneto, com.—no par	f 38½	26½	54½
Amer. Elec. Pwr., pf.	c 101½	96	104½
Amer. Gas & Elec., 6% pf.—no par	92	85	91
Amer. Gas & Elec., com.—no par	75	70	85
Amer. Lt. & Trac., 6% pf.	100	93	101½
Amer. Lt. & Trac., com.	229	139	236
Amer. Pwr. & Lt., 6% pf.	91	84	91½
Amer. Pwr. & Lt., com.—no par	55	52	67
Amer. Pub. Serv. 7% pf.	92	88	94
Amer. Pub. Serv., com.	85	45	90
Amer. Pub. Utilities, 4% pf.	80	....	....
Amer. Pub. Utilities, 6% pf.	76	71	82
Amer. Pub. Utilities, 7% pf.	88	87	95
Amer. Pub. Utilities, com.	78	70	103
Amer. Superpwr., pf.—25	27½	24½	27½
Amer. Superpwr., Class A—no par.	36	26½	39½
Amer. Superpwr., Class B—no par.	37	27½	41
Amer. Wtr. Wks. & Elec., 7% pf.	f 100½	98	103
Amer. Wtr. Wks. & Elec., com.	f 57½	34½	68½
Appalachian Pwr., 7% pf.	98	92	100
Appalachian Pwr., 1st pf., 7%	100	95	101
Appalachian Pwr., com.—no par	78	70	83
Arizona Pwr., 7% pf.	78	75	87
Arizona Pwr., com.	25	15	33
Arkansas Cent. Pwr., pf., $7—no par	100	97	102
Arkansas Lt. & Pwr., 7% pf.	98	92	102
Arkansas Lt. & Pwr., com.	100	65	101
Asheville Pwr. & Lt., 7% pf.	f 101	98	102½
Assoc. Gas & Elec., 7% pf.—1% extra—50.	f 50	....	....
Assoc. Gas & Elec., pf.—$6—no par	f 85	....	....
Assoc. Gas & Elec., Class A	f 38½	....	....
Babcock & Wilcox, com.	f 146	....	....
Birmingham Elec., pf., $7, no par	....	....	....
Birmingham Elec. pf.—$7—no par.	98	98	101½
Blackstone Valley Gas & Elec., com. —50	88	....	....
Brazilian Trac., Lt. & Pwr., com.	f 72	....	....
Broad River Pwr., pf.	90	90	97
Brooklyn Edison, com.	f 147	120½	147
Buffalo Gen. Elec., com.	63	44	73½
Buffalo, Niagara & East. Pwr., pf.—2%.	f 23½	....	....
Buffalo, Niagara & Eastern Pwr., com.	f 26	....	....
Carolina Pwr. & Lt., pf.—$7—no par	104	100	107
Carolina Pwr. & Lt., com.	420	290	430
Central Ariz. Lt. & Pwr., pf.	100	100	106
Central Ark. Ry. & Lt., 7% pf.	96	91	98
Central Ill. Pub. Serv., 6% pf.	85	84	93½
Central Ind. Pwr., 7% pf.	89	88	95
Central Pwr. & Lt., pf.	94	88	95
Central States Elec., 7% pf.	96	87	98
Central States Elec., com.	175	70	180
Chica.o Fuse Mfg., com., no par	29½	27½	39½
Cincinnati Gas & Elec., com.	g 87½	82	90
Cities Service, 6% pf.	83½	80	84
Cities Service, pf. B—10	7¾	7½	8
Cities Service, pf. BB—100	80	....	....
Cities Service, com.	38	34	43
Cities Service, Bks. Shrs.	17½	16½	22
Cleveland Elec. Illg., 6% pf.	102	101	105
Cleveland Elec. Illg., com.	240	200	250
Colorado Pwr., 7% pf.	95	93	98
Columbia Gas & Elec., 7% pf.	f 113	104½	113
Columbia Gas & Elec., com.—no par	f 76¾	45½	78½
Columbia Ry., Gas & Elec., 6% pf.	90	90	90
Columbus Elec. & Pwr., 2d pf.	f 100½	....	....
Columbus Elec. & Pwr., com.	f 153	....	....
Columbus Ry., Pwr. & Lt., pf. A	97	86	99
Columbus Ry., Pwr. & Lt., pf. B	90	80	85
Columbus Ry., Pwr., & Lt., com.	150	114	150
Commonwealth Edison, com.	a 137	130½	141½
Commonwealth Pwr., 6% pf.	82	80	85½
Commonwealth Pwr., com—no par.	34	30½	43¼
Conn. Lt. & Pwr., 8% pf.	115	115	118
Conn. Lt. & Pwr., 7% pf.	106	105	110
Cons. Gas of N. Y., pf.	f 57	....	....
Cons. Gas of N. Y., com—no par	f 91	74½	94½
Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf.	c 101½	102	104½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 6½% pf.	c 108½	102	104½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 7% pf.	c 113	109	114
Cons. Gas, Elec. Lt. & Pwr. of Balti.	c 126	122	127½
Cons. Gas, Elec. Lt. & Pwr. of Balti., com.—no par	c 45½	32	47½
Cons. Utilities of Dela., 7% pf.	j 85	80	84
Consumers Pwr., 6% pf.	95	90	97
Consumers Pwr., 6 6% pf.	101	97	102
Continental Gas & Elec., 7% ptc. pf	93	85	97
Continental Gas & Elec., 7% pr. pf.	94	89	95
Continental Gas & Elec., com.	140	77	145
Crocker Wheeler, com.	....	21	28
Crocker Wheeler, pf.	65	73	80
Dallas Pwr. & Lt., 7% pf.	102	100	102½
Dayton Pwr. & Lt., 6% pf.	94	88	100
Dayton Pwr. & Lt., com.	400	180	460
Detroit Edison, com.	f 159½	110	159½
Dubilier Condenser & Radio, com.	f 17	....	....
Dubuque Elec., 7% pf.	90	80	90
Duquesne Lt., 7% pf.	111	104	112
East. Tex. Elec., 7% pf.	100	100	105
East. Tex. Elec., com.	76½	70	75½
Edison Elec. Illum. of Boston, com	d 202½	200	213
El Paso Elec., com.	f 73	....	....
El Paso Elec., pf.	f 100½	....	....
Elec. Bond & Share, 6% pf.	f 104½	101½	106½
Elec. Bond & Share Sec., com.—no par	f 65	56½	80½
Elec. Investors, 7% pf.	94	90	100
Elec. Investors, com.	61	30	66
Elec. Investors, 10% pd. receipts	43	15	48½
Elec. Pwr. & Lt., ctfs. pf.	f 91½	89½	94
Elec. Pwr. & Lt., ctfs., 40% pd.	f 106½	100	110
Elec. Pwr. & Lt., ctfs., com.	f 32½	17½	40½
Elec. Storage Battery, com.—no par	f 67½	60½	71½
Elmira Wtr., Lt. & R.R., 7% pf.	94	93	98
Empire Dist. Elec., 6% pf.	78	78	85
Engr. Pub. Serv., pf.	99½	100	103
Engr. Pub. Serv., com.—no par	19	22½	30
Eureka Vacuum Cleaner, com.—no par	44½	42	52½
Fairbanks Morse, com.	f 45½	32½	49½
Federal Lt. & Trac., com.	f 27½	26½	36
Federal Light & Traction, pf.	f 82½	82½	86½
Federal Utilities, pf.	f 75	....	....
Federal Utilities, com.	f 17	....	....
Ft. Worth Pwr. & Lt., 7% pf.	f 105	99½	106
Galveston-Houston Elec., 6% pf.	68	70	75
Galveston-Houston Elec., com.—no par	20	32	40
Gen. Elec., com.	f 310½	227½	337½
Gen. Elec., special—10	f 11½	11	11½
Gen. Gas & Elec., 6% pf.	215	72	240
Gen. Gas & Elec., 7% pf.	165	120	175
Gen. Gas & Elec., com.	205	72	240
Gen. Gas & Elec., (Me.) pf.—$7—no par	130	90	175
Gen. Gas & Elec., (Me.) pf.—$8—no par	140	104½	180
Gen. Gas & Elec. (Del.) com. A no par	57	42	64½
Gen. Gas & Elec. (Del.) com. B no par	56	40	62
Gen. Gas & Elec. (Del.) A pf. 7% no par	97½	97½	100
Gen. Gas & Elec. (Del.) A pf. 8% no par	105	90	110
Gen. Gas & Elec. (Del.) B pf. 7% no par	94	88	96
Ga. Lt., Pwr., & Rys., 6% pf.	80	74	85
Ga. Lt., Pwr. & Rys., com.	63	25	74
Ga. Ry. & Elec. .5% pf.	j 83	78½	84½
Ga. Ry. & Elec. com.	j 124½	115½	115½
Ga. Ry. & Pwr., 8% pf.	f 112	....	....
Ga. Ry. & Pwr. 7% pf.	f 102	....	....
Ga. Ry. & Pwr., 4% pf.	102	62	110
Ga. Ry. & Pwr., com.	102	62	118
Gt. Western Pwr., 7% pf.	f 10	98½	104
Havana Elec. Ry., Lt. & Pwr., com.	f 240	112	246
Havana Elec. Ry., Lt. & Pwr., pf.	j 116	115	116
Hurley Machine, com.—no par.	a 50½	41½	56
Ill. No. Utilities, 6% pf.	88	82	92
Ill. Pwr. & Lt., 7% pf.	96	92½	98
Int. Combustion Engr., com.—no par	f 44½	31½	51
Int. Utilities, class A—no par	36½	31	46½
Int. Utilities, class B—no par.	8½	6½	17
Interstate Pwr., pf., $7, no par.	90	....	....
Interstate Pub. Serv., 7% pf.	96	90	100
Iowa Ry. & Lt., 7% pf.	97	92	100
Jersey Central Pwr. & Lt., 7% pf.	96	90	96
Jersey Central Pwr. & Lt., com.	45	15	50
Johns-Manville, com.—no par.	174	....	....

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco. iBid price, low, high, Sept. 29. jLatest quotations available.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Saturday, Sept. 26	Low 1925	High 1925
STOCKS—Continued			
Kansas Gas & Elec., 7% pf.	‡100	97½	102
Kelvinator Corp., com.—no par	‡ 46½	....	....
Kentucky Hydro-Elec., com.	a90½	85½	92½
Kentucky Sec., 6% pf.	67	67	78
Kentucky Sec., com.	80	77	87
Kentucky Utilities, 6% pf.	91	82	95
Kings County Ltg., 7% pf.	‡100	....	....
Laclede Gas Lt., com.	‡ 170½	110½	178
Lehigh Pwr. Sec., com.—no par	143	82	155
Long Island Ltg., 7% pf.	104	100	105
Long Island Ltg., com.	120	60	105
Los Angeles Gas & Elec., 6% pf.	93½	90	97
Manila Elec. com.—no par	38	28½	49½
Maytag Mfg., com.	‡ 21½	....	....
Memphis Pwr. & Lt., pf., $7, no par	102	98½	102
Metropolitan Edison, pf.—$6—no par	95	95	96
Metropolitan Edison, pf., $6, no par	104½	....	....
Metropolitan Edison, pf., $7, no par	104	100	110
Middle West Utilities, 7% pf.	a90	91½	98½
Middle West Utilities, 7% pr. lien pf.	c104½	98	107½
Middle West Utilities, com.—no par	a107½	82½	125
Midland Utilities, pr. in. pf.	a 99½	98½	101
Milwaukee Elec. Ry. & Lt., 8% pf.	100	98	105
Milwaukee Elec. Ry. & Lt., 7% pf.	97½	96	105
Milwaukee Elec. Ry. & Lt., 6% pf.	87	83½	87
Minn. Pwr. & Lt., 7% pf.	‡ 99½	97½	102
Miss. Pwr. & Lt., pf.	‡100	....	....
Miss. River Pwr., 6% pf.	92	87½	94
Miss. River Pwr., com.	62	37	68
Montana Pwr., com.	‡ 85½	64	99½
Montreal Pwr., com.	f209½	....	....
Mountain States Pwr., pf.	‡ 94	....	....
MountainStates Pwr., com.	‡ 26	....	....
National Carbon, pf.,	a122	120	130
National Elec. Pwr., pf.	‡ 95	94	96½
National Lt., Ht. & Pwr., 6% pf.	66	40	65
National Lt., Ht. & Pwr., com.—no par	11	11	....
National Pwr. & Lt., pf., $7—no par	100	95	99
National Pwr. & Lt., com.—no par.	378	185	363
National Pub. Serv., 7% pf.	‡ 95	....	....
National Pub. Serv., pfc. pf.	‡ 98	....	....
National Pub. Serv., A com.—no par	‡ 24	....	....
National Pub. Serv., B com.—no par	‡ 16	....	....
Nebraska Pwr., 7% pf.	‡101	98½	103½
Nevada-Calif. Elec., com.	38½	31	50½
N. J. Pwr. & Lt., 7% pf.	107	92	102
New Orleans Pub. Serv., 7% pf.	99	94	102
New Orleans Pub. Serv., com.—no par	f 30	31	38½
N. Y. Central Elec., 7% pf.	99	96	101
Niagara Falls Pwr., 7% pf.—25	28	27½	29
Niagara, Lock. & Ont. Pwr., 7% pf.	f 106	101½	110
Niagara, Lock. & Ont. Pwr., com.—no par	‖f 65	60	73
Nizer Corp., A.—no par	66	37	70
Nizer Corp., B.—no par	‡ 60½	....	....
No. Amer., 6% pf.—50	50½	46½	50½
No. Amer., com.—50	‡ 58½	41½	60½
No. Caro. Pub. Serv., pf.—$7—no par	91	90	96
No. N. Y. Utilities, 7% pf.	‡101	....	....
No. Ohio Pwr., com.	10½	5	13½
No. Ohio Trac. & Lt., 6% pf.	73	64	75
No. Ont. Lt. & Pwr., pf.	78	68	78
No. Ont. Lt. & Pwr., com.	47	41	52
No. States Pwr., 7% pf.	100	95	100
No. States Pwr. com.	123	103	125
No. Texas Elec., 6% pf.	50	60	75
No. Texas Elec., com.	40	40	70
Ohio Gas & Elec., 7% pf.	90	87	100
Ohio Pwr., 6% pf.	91	85	95
Ohio Pub. Serv., 7% pf.	96	97	100
Ohio River Edison, 7% pf.	97	93½	100½
Oklahoma Gas & Elec., pf.	‡94	....	....
Ohio River Edison, pf.	....	....	....
Pacific Gas & Elec., 6% pf.	96	92	99
Pacific Gas & Elec., com.	f126	102½	128½
Pacific Pwr. & Lt., 7% pf.	‡ 98	97½	100½
Parr Shoals Pwr., 6% pf.	92	90	100
Penn Central Lt. & Pwr., pf.—no par	69½	60	70½
Penn-Ohio Elec., 7% pf.	93	83½	96
Penn-Ohio Pwr. & Lt., 7% pf.	93	91	100
Penn-Ohio Pwr. & Lt., 8% pf.	103	101	110
Penn Pwr. & Lt.—$7—no par.	‡103	98½	106
Penn Pub. Serv., 7% pf.	95	90	100
Penn Pub. Serv., 6% pf.	85	80	90
Penn Wtr. & Pwr., com.	f162½	126½	185
Phila. Co., pf.—50	c 49	45	49½
Phila. Co., com.	‡ 58½	51½	62½
Phila. Elec., com.	c 46½	37½	49½
Pittsburgh Utilities, pf.	‡ 15	12½	17½
Portland Elec. Pwr., 7% pf.	98	95	99
Portland Elec. Pwr., 6% pf.	68	70	80
Portland Elec. Pwr., com.	39	40	53
Portland Ry., Lt. & Pwr., pf.	f 72	....	....
Portland Ry., Lt. & Pwr., com.	f 4½	....	....
Pwr. Corp. of N. Y., 7% pf.	f‖ 0	96	1·2
Pwr. Corp. of N. Y., com—no par	81	15	89½
Pwr. Sec., pf.	30	30	55
Pwr. Sec., com.	15	8	30
Pub. Serv. of N. J., 7% pf.	105	99	105½
Pub. Serv. of N. J., 8% pf.	114½	108½	116
Pub. Serv. of N. J., com—no par.	‡ 79½	62½	87½
Pub. Serv. of No. Ill., 6% pf.	98½	92	100
Public Serv. of No. Ill., 7% pf.	a109	102	110½
Pub. Serv. of No. Ill., com.—no par	a126	107½	128½
Pub. Serv. of No. Ill., com.	a126	118	128½
Pub. Serv. of Okla., 7% pf.	94	87	95
Pub. Serv. Elec. & Gas, 8% pf.	‡ 97½	92½	97½
Puget Sound Pwr. & Lt., 7% pf.	106	102½	107
Puget Sound Pwr. & Lt., 6% pf.	‡ 84	....	....
Puget Sound Pwr. & Lt., com.	53	49	61
Radio Corp. of Amer., pf.—50	48	48	54
Radio Corp. of Amer., com.—no par	‡ 60½	48½	77½
Republic Ry & Lt., pf.	80	70	85
Republic Ry. & Lt., com.	63	49	65
Rochester Gas & Elec., 5% pf.	105	80	98
Servel Corp., Class A	‡ 31½	....	....
Sierra Pacific Elec., com.	‡ 16	....	....
Sioux City Gas & Elec., 7% pf.	‡ 99	....	....
Southeastern Pwr. & Lt., 7% pf.	97	90	100
Southeastern Pwr. & Lt., com.	149	45	158
So. Calif. Edison, 8% pf.	125	115	128
So. Calif. Edison, 7% pf.	109	105	107½
So. Calif. Edison, 6% pf.	97	90	95½
So. Calif. Edison, com.	136	102	139
Southern Cities Utilities, 7% pf.	80	77	100
Southern Cities Utilities, com.	63	30	71
Southern Pwr. & Lt. of Md., pf.	‡107	....	....
Southern Pwr. & Lt. of Md., com.	‡ 32	....	....
Southwestern Pwr. & Lt., A.	‡ 47	....	....
Southwestern Pwr. & Lt., B.	‡ 22½	....	....
Southwestern Pwr. & Lt., 7% pf.	98½	90	102
Springfield (Mo.) Ry. & Lt., 7% pf.	92	92	93
Standard Gas & Elec., 8% pf.	‡ 54	50½	55½
Standard Gas & Elec., 7% pf.	100	96	100
Standard Gas & Elec., com.—no par	‡ 58	40½	59½
Standard Pwr. & Lt., 7% pf.	108	95	114½
Superheater, com.—No par	141	120	152
Tampa Elec., com.	‡240	....	....
Tenn. Elec. Pwr., 6% pf.	85	80	85
Tenn. Elec. Pwr., 7% pf.	101	93	103
Tenn. Elec. Pwr., pf.—$6—no par.	f80	72	84
Tenn. Elec. Pwr., com.—no par.	‡65	....	....
Tex. Pwr. & Lt., 7% pf.	‡101	99½	103½
Tide Water Pwr., 8% pf.	‡98	....	....
Timken Roller Bearing, com.	‡ 44½	37½	46½
Toledo Edison, 8% pf.	111	109	114
Toledo Edison, 7% pf.	101	94	101½
Toledo Edison, com.	25	21	25
Tri-City Ry. & Lt., 6% pf.	86	82	85
United Gas & Elec., 6% pf.	91	80	94
United Gas & Elec., com.—no par.	41	26	49
United Gas & Elec. (N. J.), 5% pf.	62	55	65
United Gas Impr.—50	c 96½	79½	100½
United Lt. & Pwr., pf.—$4—no par	50	41	51
United Lt. & Pwr., pf.—$6.50—no par	92	83	99
United Lt. & Pwr., com., A—no par.	143	42	145
United Lt. & Pwr., com., B—no par.	160	49	100
Utah Pwr. & Lt., 7% pf.	‡ 98	97½	101½
Utica Gas & Elec., 7% pf.	102	100	104
Utica Gas & Elec., com.	200	100	209
Utilities Pwr. & Lt., 7% pf.	90	90	97
Utilities Pwr. & Lt., com. B—no par	18	12	20
Vermont Hydro-Elec., 7% pf.	90	87	96
Virginia Pwr., 7% pf.	101	94	107
Virginia Pwr., com.	65	65	92
Virginia Ry. & Pwr., com.	‡125	64½	136½
Wagner Elec., pf.	b 91½	79	92
Wagner Elec., com.—no par	b 46½	26½	50
Washington Wtr. Pwr., com.	129	110	140
West Mo. Pwr., 7% pf.	‡ 91	....	....
West Penn., 7% pf.	‡ 96½	94	100
West Penn. com.	‡ 110½	97	145
West Virginia Lt., Ht. & Pwr., 7% pf.	94	94½	96½
West Va. Utilities, 7% pf.—50	40	38	47
Western Elec., 7% pf.	83	110	117½
Western Pwr., 7% pf.	95	84	95½
Western Pwr., com.—no par	74	34	74½
Western States Gas & Elec., 7% pf.	89	82	92
Western States Gas & Elec., com.	‡ 19	....	....
Westinghouse Elec. & Mfg. com.—50	‡ 75½	66½	84
Weston Elec. Instrument, cl. A.	‡27	19½	27½
Weston Elec. Instrument, com.	‡ 17½	9½	20½
Wis.-Minn. Lt. & Pwr., 7% pf.	f90	92	95
Wis. Pwr., Lt. & Ht., 7% pf.	85	85	90
Worthington Pump, pf. A	76	77	88
Worthington Pump, pf. B	59	58	76½
Worthington Pump, com.	‡ 40½	35½	79½
Yadkin River Pwr., 7% pf.	‡103½	98	105
Yale & Towne, com.—25	62½	62	70½

BONDS

Companies			Bid Price Saturday, Sept. 26	Low 1925	High 1925
Abitibi Pwr. & Paper	6s	1940	100	98	100½
Adir. Elec. Pwr.	5s	1962	99	97½	100½
Adir. Pwr. & Lt.	6s	1950	104½	102½	105½
Adir. Pwr. & Lt.	5s	1930	95	94	97½
Ala. Pwr.	5s	1946	98½	96	100
Ala. Pwr.	5s	1951	96	92½	97½
Ala. Pwr.	6s	1951	104½	101½	105
Ala. Trac. Lt. & Pwr.	5s	1962	100½	86	102
Aluminum Co. of Amer.	7s	1933	106½	106½	107½
Amer. Bosch Magneto	8s	1936	100	86	101
Amer. Gas & Elec.	5s	2007	92½	90	93½
Amer. Gas & Elec.	6s	2014	97	96½	98½
Amer. Pwr. & Lt.	6s	2016	95½	94	98
Amer. Pub. Serv.	6s	1946	97½	94	99½
Amer. Wtr. Wks. & Elec.	5s	1934	95½	92½	98
Anaconda Copper	6s	1929	103	....	....
Anaconda Copper	6s	1953	100½	99½	102
Anaconda Copper	7s	1938	102½	99½	104
Appalachian Pwr.	5s	1941	97½	96	99½
Appalachian Pwr.	6s	2024	92½	86½	94½
Appalachian Pwr.	7s	1936	105½	105½	106½
Arizona Pwr.	6s	1933	100	97½	101½
Arizona Pwr.	6s	1947	95	90	96
Ark. Central Pwr.	6s	1948	100½	98½	102½
Ark. Lt. & Pwr.	6s	1945	101½	100	104½
Ark. Lt. & Pwr.	6s	1954	97½	92½	99½
Assoc. Gas & Elec.	6s	1965	93½	92	96
Assoc. Gas & Elec.	6½s	1954	103	94½	106
Binghamton Lt., Ht. & Pwr.	5s	1946	98	94½	98½
Birmingham Elec.	6s	1954	100½	99	103
Birmingham Ry., Lt. & Pwr.	4½s	1954	88	85	89½
Broad River Pwr.	6½s	1934	100½	99	102
Brooklyn Edison	5s	1949	101½	99½	103
Brooklyn Edison	6s	1930	104½	103½	106
Buffalo Elec. Elec. 1st	5s	1939	101½	100½	101½
Buffalo Gen. Elec. 1st & Ref.	5s	1939	100½	100	100½
Burlington Ry. & Lt.	5s	1932	94½	90	96
Butte Elec. & Pwr.	5s	1951	100	99	100½
Calif. Gas & Elec.	5s	1937	100½	98	101½
Canadian Lt. & Pwr.	5s	1949	40	36	62
Canton Elec.	5s	1937	99	99	100½
Carolina Pwr. & Lt.	5s	1938	99½	98½	100½
Carolina Pwr. & Lt.	6s	1953	104½	103½	105
Cedar Rapids Mfg. & Pwr.	5s	1953	99½	98½	100½
Central Ark. Ry. & Lt.	5s	1928	98½	98½	100
Central Ga. Pwr.	5s	1938	95½	93	97
Central Ill. Lt.	5s	1943	97½	94	99½
Central Ill. Publ Serv.	5s	1952	90	84½	92½
Central Ill. Pub. Serv.	6s	1944	98	96½	101½
Central Ind. Pwr.	6s	1947	97½	95½	99½
Centralia. Pwr. & Lt.	6s	1944	99	97	100½
Central N. Y. Gas & El.	5s	1941	95	94	97½
Central Pwr. & Lt.	6s	1946	101	97½	101½
Central Pwr. & Lt.	6½s	1952	101	94	102
Central States Elec.	5s	1926	99	98	100½
Chattanooga Ry. & Lt.	5s	1956	84	81	85
Cincinnati Gas & Elec.	5s	1956	109	98½	104½
Cincinnati Gas & Elec.	5½s	1967	103½	100½	105
Cities Service	6s	1966	90½	90	91½
Cities Service	7s B	1966	176½	150½	178½
Cities Service	7s C	1966	125	111	128
Cities Service	7s D	1966	102½	98½	106½
Cities Service	7s E	1966	112½	112½	112½
Cities Service Pwr. & Lt.	6s	1944	94	92	94½
City Lt. & Trac., Sedalia, Mo.	5s	1952	84	74	85½
Cleveland Elec. Illum.	5s	1939	101½	100	102
Cleveland Elec. Illum.	5s	1954	100½	97½	101
Cleveland Elec. Illum.	7s	1941	110	109	111½
Colorado Pwr.	5s	1953	96	93	96½
Columbia Gas & Elec.	5s	1927	99½	99½	100½
Columbia Ry., Gas & El.	5s	1936	92	92½	94½
Columbus, Delaware & Marion Elec.	5s	1937	85	83	88
Columbus, Dela. & Marion Elec.	6s	1937	95	91	98
Columbus Elec. & Pwr.	6s	1947	‡102	....	....
Columbus Ry., Pwr. & Lt.	5s	1940	95½	93½	98
Columbus Ry., Pwr. & Lt.	6s	1941	103	101½	105
Commonwealth Edison	5s	1943	a102	99½	102½
Commonwealth Edison	5s	1953	99½	98½	101
Commonwealth Edison	5s	1954	99½	98	101
Commonwealth Pwr.	6s	1947	102½	97½	103½
Community Pwr. & Lt.	6s	1950	96	94½	98
Conn. Ry. & Ltg.	4½s	1951	89½	90½	92½
Consol. Cities, Lt., Pwr. & Trac.	5s	1962	80½	75½	82½
Consol. Elec.	5s	1955	96	94	98½
Consol. Gas of N. Y.	5½s	1945	103½	101½	105
Con. Gas, Elec. Lt. & Pwr. of Balti.	4½s	1935	97	95½	97½
Con. Gas, Elec. Lt. & Pwr. of Balti. (notes)	6s	1949	c105½	104½	106
Con. Gas, Elec. Lt. & Pwr. of Balti.	5s	1965	c99½	99	100½
Consumers Elec. Lt. & Pwr.	5s	1936	94	93	96½
Consumers Pwr.	5s	1936	99½	99	100½
Consumers Pwr.	5s	1952	97½	90½	100
Consumers Pwr.	5½s	1954	103	99	104½
Continental Gas & Elec.	5s	1927	99½	99½	100½
Continental Gas & Elec.	6s	1947	99½	98	101
Continental Gas & Elec.	6½s	1964	98	96½	101
Continental Gas & Elec.	7	1954	103	99	103½
Cumberland County Pwr. & Lt.	5s	1942	94½	92	96½
Dallas Pwr. & Lt.	6s	1949	104½	103	105½
Dayton Ltg.	5s	1937	99½	98½	100½
Dayton Pwr. & Lt.	5s	1941	99	97	100½
Defiance Gas & Elec.	5s	1942	94½	88½	97½
Denver Gas & Elec.	5s	1949	98	97½	100
Denver Gas & Elec. Lt.	5s	1951	93	92	95½
Des Moines Elec.	5s	1938	98	98	100½
Detroit Edison	5s	1933	101½	99½	102½
Detroit Edison	5s	1940	102½	99½	102½
Detroit Edison	5s	1949	99½	97½	101½
Detroit Edison	5s	1955	99½	97½	100
Detroit Edison	6s	1932	150	110½	153
Detroit Edison	6s	1940	107	106½	108½
Detroit Edison	7s	1928	150	125	151½
Detroit Edison	7s	1929	144	114	150
Detroit Edison	7s	1930	147½	121½	151
Dominion Pwr. & Trans.	5s	1932	95	95½	98½
Driver-Harris	8s	1931	93	88	97
Dubuque Elec.	6s	1942	100½	97½	101½
Duke-Price Pwr.	6s	1949	101	98½	103
Duquesne Lt.	6s	1949	106	104½	107½
Duquesne Lt.	5½s	1949	104½	104	106
Durham Pub. Serv.	7s	1949	100	97½	101½
East Penn. Elec.	6s	1953	104	100½	105½
East Oregon Lt. & Pwr.	6s	1929	100	97½	100½
East. Tex. Elec.	5s	1942	f 94½	....	....
Economy Lt. & Pwr.	5s	1956	98	96	99½
Edison Elec. Illum. of Bkln.	4s	1939	93	89	95½
Edison Elec. Illum. (N. Y.)	5s	1995	101½	99½	103
El Paso Elec.	5s	1932	‡102	....	....
El Paso Elec.	5s	1950	‡ 95½	....	....
Elec. Pwr. Corp. (Germany)	6½s	1950	87½	86½	88½
Emira Wtr., Lt. & R.R.	5s	1956	95	92½	96½
Empire Dist. Elec.	5s	1949	90	86½	91½
Erie Ltg.	5s	1967	98	95½	99½
Evansville Gas & Elec. Lt.	5s	1932	98½	96	100
Federal Lt. & Trac.	5s	1942	93	88	96½
Federal Lt. & Trac.	6s	1942	101½	96½	103
Federal Lt. & Trac.	6s	1954	91½	91½	94½
Ft. Smith Lt. & Trac.	5s	1936	78½	76½	82½
Ft. Worth Pwr & Lt.	5s	1931	99	99	100½
Galveston Elec.	5s	1940	91	86½	93½
General Elec.	3½s	1942	87½	83	87½
General Elec.	5s	1952	107½	101½	107½
Georgia Carolina Pwr.	5s	1952	86½	82	90
Ga. Lt., Pwr. & Rys.	5s	1941	88	86½	90½
Ga. Ry. & Elec.	5s	1932	98	98½	100½
Ga. Ry. & Elec.	5s	1949	91½	88	94½
Ga. Ry. & Pwr.	5s	1954	93½	89½	96
Ga. Ry. & Pwr.	6s	1947	102	100½	103½
Ga. Ry. & Pwr.	7s	1941	104½	105	107
German Gen. Elec.	7s	1945	94½	92	94½
Great Cons. Elec. Pwr. (Japan)	6½s	1950	86½	86	86½
Great Cons. Elec. Pwr. (Japan)	7s	1944	90½	87½	91½
Great Falls Pwr.	5s	1940	102	99½	102½
Great Northern Pwr.	5s	1935	98	96	99
Great Western Pwr.	5s	1946	98½	95	99½
Great Western Pwr.	5½s	1955	97½	96	99
Great Western Pwr.	6s	1949	100½	100	102½
Great Western Pwr.	6s	1952	101	99½	102½
Havana Elec. Ry., Lt. & Pwr.	5s	1954	92½	85½	95½
Holtwood Pwr.	6s	1954	103	100	104½
Houston Ltg. & Pwr.	5s	1931	99½	98½	100
Houston Ltg. & Pwr.	5s	1953	94	90½	95½
Houston Ltg. & Pwr.	5½s	1954	100	97	101½
Hydraulic Pwr.	5s	1951	101	99½	102
Hydraulic Pwr.	5s	1950	101	100	103
Idaho Pwr.	5s	1947	94½	93	97½

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia dBoston; eBaltimore; fMontreal; g Cincinnati; hSan Francisco. iBid price, low, high, Sept. 29. jLatest quotations available.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

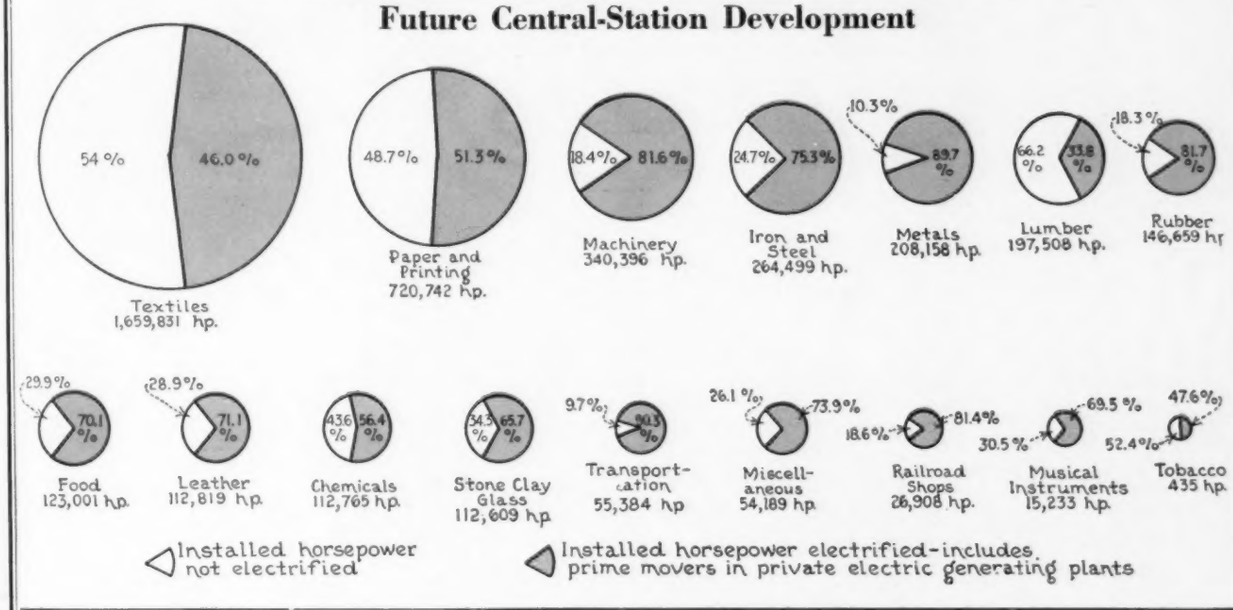
Companies			Bid Price Saturday, Sept. 26	Low 1925	High 1925
BONDS (Continued)					
Ill. Elec. Pwr.	6s	1943	102	99½	103½
Ill. Pwr.	5s	1933	93½	93	95½
Ill. Pwr. & Lt.	6s	1953	100½	100½	102½
Ill. Pwr. & Lt.	7s	1953	100½	99	102½
Ind. Elec.	6s	1947	98	97	99½
Ind. Gen. Serv.	5s	1948	95	92	97½
Ind. Lighting	4s	1958	80½	78	83
Indiana & Mich. Elec.	5s	1957	98½	97½	99½
Indiana & Mich. Elec.	5s	1955	95	95	98
Ind. Pwr.	7½s	1941	*105½	104	106
Ind. Service	5s	1950	89½	86½	92
Ind. Service	6s	2020	86½	73	88½
Ingersoll-Rand	5s	1935	99½	92	99½
Interstate Elec.	6s	1933	95	95	99½
Interstate Pwr.	6s	1944	97½	95	99½
Interstate Pwr.	7s	1934	99½	97	100½
Interstate Pub. Serv.	6s	1948	98	96	100½
Iowa Ry. & Lt.	5s	1932	97½	97	99½
Jersey Cent. Pwr. & Lt.	5½s	1945	96	95	98
Kansas City Pwr. & Lt.	5s	1952	99½	95½	101
Kansas Elec. Pwr.	6s	1937	100	97½	102
Kansas Elec. Pwr.	6s	1943	100	97½	102
Kansas Gas & Elec.	6s	1952	101	98½	103½
Kansas Gas & Elec.	6s	2022	91½	86½	94
Kentucky Utilities	6s	1949	99½	97	101½
Kings County Elec. Lt. & Pwr.	5s	1937	102½	99	103
Kings County Elec. Lt. & Pwr.	6s	1997	118½	114½	120½
Kings County Ltg.	5s	1954	98½	89	101½
Kings County Ltg.	6½s	1954	105	103½	108½
Knoxville Ry. & Lt.	5s	1946	92½	88	95½
Laclede Gas Lt.	5s	1934	100½	98½	101½
Laclede Gas Lt.	5½s	1953	100	95½	102
Laurentian Pwr.	6s	1936	99	96	100
Laurentide Pwr.	6s	1936	*99	96	100
Laurentide Pwr.	5s	1946	99½	97	100½
Lehigh P'r. Sec. (notes)	6s	1927	101	100½	101½
Lincoln Gas & Elec.	5s	1941	90	92½	95½
Long Island Ltg.	5s	1936	100	98½	100½
Long Island Ltg.	6s	1954	100½	99½	102
Long Island Ltg.	6s	1948	103	102	105½
Long Island Ltg.	6s	1954	100½	99½	102
Los Angeles Gas & Elec.	5s	1939	98	98	101½
Los Angeles Gas & Elec.	5½	1943	97½	94	99½
Los Angeles Gas & Elec.	5½s	1947	97½	96	99½
Los Angeles Gas & Elec.	5½s	1949	97	95½	99½
Los Angeles Gas & Elec.	6s	1942	100½	101½	104½
Louisiana Pwr.	6s	1944	97½	97	99
Louisville Gas & Elec.	5s	1952	96½	90½	99½
Louisville Gas & Elec.	5½s	1954	101½	99	102
Lower Austrian Hydro-Elec.	6½s	1944	85½	85½	86½
Luzerne County Gas & Elec.	5s	1948	98	97	99½
Luzerne County Gas & Elec.	7s	1944	103	99½	104½
Luzerne County Gas & Elec.	6s	1954	101½	99	105
Madison River Pwr.	5s	1935	99½	99½	101
Manila Elec.	7s	1942	102½	97½	102½
Manila Elec. Ry. & Ltg.	5s	1953	89½	85	92
Manitoba Pwr.	7s	1941	104	98½	104½
Memphis Pwr. & Lt.	5s	1948	98½	95	99½
Metropolitan Edison	6s	1952	102½	101½	106
Metropolitan Edison	6s	1953	95½	91½	97
Metropolitan Pwr.	6s	1953	102½	100	104
Michigan Lt.	5s	1946	98	97½	100
Michigan No. Pwr.	5s	1941	96	95½	97
Milwaukee Elec. Ry. & Lt.	5s	1926	99½	99½	101½
Milwaukee Elec. Ry. & Lt.	4½s	1931	96½	94½	96½
Milwaukee Elec. Ry. & Lt.	5s	1951	98½	94	100
Milwaukee Elec. Ry. & Lt.	5s	1961	89½	84½	92½
Milwaukee Elec. Ry. & Lt.	6s	1953	100½	98½	104
Minn. Pwr. & Lt.	5s	1955	95	95	97
Minn. Pwr. & Lt.	6s	1950	103½	101½	105½
Miss. River Pwr.	5s	1951	99	96½	100½
Miss. River Pwr.	7s	1935	103	102	104
Mo. Edison Elec.	5s	1927	b100	100	100½
Mobile Elec.	5s	1946	95	91	97½
Montana Pwr.	5s	1943	99½	97½	100½
Montgomery Lt. & Wtr. Pwr.	5s	1943	*93	86½	93½
Montreal Lt., Ht. & Pwr.	4½s	1932	97	97	98½
Montreal Lt., Ht. & Pwr.	5s	1933	98½	98½	101
Montreal Pub. Serv.	5s	1942	94½	89	94½
Mountain States Pwr.	6s	1938	98½	96½	100½
Nashville Ry. & Lt.	5s	1953	97	94	98
Nashville Ry. & Lt.	5s	1958	89	84	88½
Nassau Lt. & Pwr.	5s	1927	99½	98	101
Nassau & Suffolk Ltg.	5s	1945	88	82	91
National Pwr. & Lt.	7s	1972	101	97	103½
National Pub. Serv.	6½	1955	95½	94	96½
Nebraska Pwr.	5s	1949	99	97	99½
Nebraska Pwr.	6s	2022	95½	89½	95½
Nevada-Calif. Elec.	6s	1946	99	96½	100½
Nevada-Calif. Elec.	6s	1950	99	96½	100½
New England Pwr.	5s	1951	101	100½	103
New Jersey Pwr. & Lt.	5s	1936	95½	92½	97½
New Orleans Pub. Serv.	4½s	1935	85½	83½	88½
New Orleans Pub. Serv.	5s	1952	91½	90	92
New Orleans Pub. Serv.	5s	1955	90½	89	90½
New Orleans Pub. Serv.	6s	1949	92	86½	93½
N. Y. & Queens Elec. Lt. & Pwr.	5s	1930	100½	99½	100½
N. Y. & Westchester Ltg.	4s	2004	78	76	81
N. Y. & Westchester Ltg.	5s	1954	94	93	95½
New York Edison	6½s	1941	114½	112	115½
New York Edison	5s	1944	101½	99½	102
N. Y. Gas & Elec. Lt., Ht. & Pwr.	5s	1948	103½	100½	104½
N. Y. Gas & Elec. Lt., Ht. & Pwr.	4s	1949	88½	86	90½
N. Y. State Gas & Elec.	5½s	1962	100½	96	101½
Newport News & Hampton Ry., Gas & Elec.	5s	1944	89	84	93
Niagara Falls Pwr.	5s	1932	103	100	103
Niagara Falls Pwr.	6s	1932	106½	103½	106½
Niagara Falls Pwr.	6s	1950	104½	105½	106½
Niagara, Lock. & Ont. Pwr.	5s	1954	*98½	104½	110
Niagara, Lock. & Ont. Pwr.	5s	1955	98½	97½	100
Niagara, Lock. & Ont. Pwr.	6s	1958	104½	104½	110½
Norfolk Ry. & Lt.	5s	1949	94	93	95½
No. Amer. Edison	6s	1952	101½	96½	102½
No. Amer. Edison	6½s	1948	104½	100½	106
No. Amer. Lt. & Pwr.	7s	1954	98½	97	100
North Caro. Pub. Serv.	5s	1934	89	89	93½
North Caro. Pub. Serv.	6s	1954	94	91½	96
North Caro Pub. Serv.	6½s	1944	98	96	100
North Shore Elec.	5s	1940	99	97½	100
No. Calif. Pwr.	5s	1948	99	98½	100½
No. Ind. Gas & Elec.	5s	1929	99	97	100½
No. Ind. Gas & Elec.	6s	1952	100	99½	103½
Northern N. Y. Utilities	5½s	1949	99	96½	100½
No. Ohio Trac. & Lt.	4s	1933	85	82	87½
No. Ohio Trac. & Lt.	5s	1956	81	78	87
No. Ohio Trac. & Lt.	6s	1926	98½	98½	100
No. Ohio Trac. & Lt.	6s	1947	94	91	97
No. Ontario Lt. & Pwr.	6s	1931	98½	95½	99½
No. States Pwr.	6½s	1933	118½	105½	121
No. States Pwr. (notes)	6½s	1933	103	99½	104½
No. States Pwr.	6s	1948	102	101	104½
No. States Pwr.	6s	1941	105½	103	107½
No. States Pwr.	5s	1941	96½	93	99½
No. Tex. Elec.	5s	1940	78	80½	82½
Northwestern Elec.	6s	1935	101	101	102½
Northwestern Pub. Serv.	6½s	1948	99	97½	100½
Ohio Pwr.	5s	1952	92	89½	96
Ohio Pwr.	6s	1953	102½	101	104½
Ohio Pwr.	6s	2024	92½	88½	95½
Ohio Pwr.	7s	1951	106	106½	107½
Ohio Pub. Serv.	5s	1954	90½	87	93
Ohio Pub. Serv.	6s	1953	100½	98	101½
Ohio Pub. Serv.	7½s	1946	111½	108	112½
Ohio Pub. Serv.	7s	1947	109	107½	111½
Ohio River Edison	6s*	1948	102	98½	104
Okla. Gas & Elec.	5s	1950	91½	93½	96
Okla. Gas & Elec.	6s	1940	96	96	98½
Ontario Pwr. of Niagara Falls	5s	1943	99½	98	100½
Ontario Transmission	5s	1945	99½	97	99½
Ozark Pwr. & Wtr.	5s	1952	76	75	81
Pacific Coast Pwr.	5s	1940	98	97½	99½
Pacific Gas & Elec.	5s	1942	96½	93½	99
Pacific Gas & Elec.	5s	1955	*9	94	95½
Pacific Gas & Elec.	5½s	1952	100½	97½	102½
Pacific Gas & Elec.	6s	1941	105½	103½	106½
Pacific Lt. & Pwr.	5s	1951	99	98½	100½
Pacific Lt. & Pwr.	5s	1942	99½	98	101½
Pacific Pwr. & Lt.	5s	1930	99½	98	100
Pacific Pwr. & Lt.	5s	1953	*96½	...	...
Parr Shoals Pwr.	5s	1952	94	92½	97
Patterson & Passaic Gas & Elec.	5s	1949	99½	96	100½
Penn Central Lt. & Pwr	6s	1953	101½	102	104½
Penn Edison	5s	1946	96½	94	97½
Penn Elec.	6's	1954	97	96	99½
Penn. Elec.	6s	1955	93½	93½	95
Penn Ohio Elec.	6½s	1938	104½	99½	105
Penn Ohio Pwr. & Lt.	5½s	1954	97½	95	99½
Penn Ohio Pwr. & Lt.	6s	1939	97	94	99½
Penn Pwr. & Lt.	5s	1952	97	95	98½
Penn Pwr. & Lt.	5s	1953	96½	95	98½
Penn Pwr. & Lt.	6s	1953	104½	102½	105½
Penn Pwr. & Lt.	7s	1951	106	106	107½
Penn Pub. Serv.	5s	1954	94½	93	96½
Penn Pub. Serv.	6s	1947	102½	103	105½
Penn Wtr. & Pwr.	5s	1940	100	99½	102
Penn Wtr. & Pwr.	5½s	1953	102	99½	103
Phila. Co.	6s	1944	103½	101½	105
Phila. Co.	5½s	1938	98½	93½	100
Phila. Co.	5s	1951	95	95	97
Phila. Elec.	5s	1966	c104½	100	104½
Phila. Elec.	5s	1960	c100	99	103½
Phila. Elec.	5½s	1947	c106	103½	107
Phila. Elec.	5½s	1953	c106	104½	107½
Phila. Elec.	6s	1941	106½	104	108
Portland Elec. Pwr.	6s	1947	99½	96½	100½
Portland Gen. Elec.	5s	1935	99½	98½	100½
Portland Ry., Lt. & Pwr.	5s	1942	87½	84½	92
Portland Ry., Lt. & Pwr.	6s	1947	98½	94	100½
Portland Ry., Lt. & Pwr.	7½s	1946	106	105½	108
Potomac Edison	6s	1949	98	96	100
Potomac Edison	6½s	1948	101	99	103½
Potomac Elec. Pwr.	5s	1929	100	99	100½
Potomac Elec. Pwr.	5s	1936	99	98½	100
Power Corp. of N. Y.	6s	1942	99	97½	101
Power Corp. of N. Y.	6½s	1942	10'½	99½	103½
Power Securities	6s	1949	£80	...	...
Pub. Lt. & Pwr.	5s	1945	74	64	79
Pub. Serv. Co. of Colo.	5½s	1954	93½	92	96½
Pub. Serv. Co. of Colo.	6s	1953	99	98	101
Pub. Serv. Co. of Colo.	7s	1933	99	98½	102½
Pub. Serv. Corp. of N. J.	5s	1959	104½	103½	105½
Pub. Serv. Corp. of N. J.	6s	1944	99½	95	100
Pub. Serv. Co. of No. Ill.	5s	1956	96	91	97½
Pub. Serv. Co. of No. Ill.	5½s	1962	100½	96½	102½
Pub. Serv. Co. of No. Ill.	5½s	1964	100½	96½	102½
Pub. Serv. Co. of Okla.	6s	1949	99	97	103
Pub. Serv. Elec. & Gas.	5½s	1959	103½	98½	105½
Pub. Serv. Elec. & Gas.	5½s	1964	103	99½	105
Public Utilities (Evansville, Ind.)	6s	1929	99½	99	101
Puget Sound Pwr.	5s	1933	98½	98½	100½
Puget Sound Pwr. & Lt.	5½s	1949	98½	96½	100½
Quebec Pwr.	6s	1953	101½	98½	102½
Queensborough Gas & Elec.	5s	1952	99	96½	100½
Queensborough Gas & Elec.	6s	1953	103	101	105
Rio de Janeiro Tram., Lt. & Pwr.	5s	1935	91½	85	91½
Robbins & Myers	7s	1952	6 ½	57½	73½
Rochester Gas & Elec.	5½s	1948	102	102	104½
Rochester Gas & Elec.	7s	1946	109	109½	111
Rockford Elec.	5s	1939	99	98	101
St. Joseph Ry., Lt., Ht. & Pwr.	5s	1937	9'½	85½	92
St. Paul Gas Lt.	5s	1944	100	98½	100½
St. Paul Gas Lt.	5½s	1954	101	98	102½
Salt River Valley Wtr.	6s	1938	f100	...	...
Salmon River Pwr.	5s	1952	99½	98½	101½
San Antonio Gas & Elec.	5s	1949	97	96	98½
San Antonio Pub. Serv.	6s	1952	101½	99½	104
San Diego Cons. Gas & Elec.	5s	1939	99½	98	101
San Diego Cons. Gas & Elec.	6s	1939	101½	99	103
San Joaquin Lt. & Pwr.	5s	1945	98	98	100
San Joaquin Lt. & Pwr.	6s	1950	101½	101	103½
San Joaquin Lt. & Pwr.	6s	1952	101	99½	a103½
San Joaquin Lt. & Pwr.	6s	1954	100	99	101
Savannah Elec. & Pwr.	7½s	1941	f104½	....	....
Saxon Pub. Wks. (Germany)	7s	1945	92½	90½	93½
Scranton Electric	5s	1937	99½	99½	101½
Seattle Elec.	5s	1930	99	99½	101
Seattle Elec.	5s	1929	99	99	100½
Seattle Elec.	5s	1939	90	90	93½
Seattle Ltg.	5s	1949	89	85½	92
Shawinigan Wtr. & Pwr.	5s	1934	100	100	101½
Shawinigan Wtr. & Pwr.	5½s	1950	102	101½	104
Shawinigan Wtr. & Pwr.	6s	1950	104½	104	106½
Siemens & Halske	7s	1928	96½	93½	99½
Siemens & Halske	7s	1935	95½	90½	96½
Sierra & San Francisco Pwr.	5s	1949	75½	75	80
Sierra & San Francisco Pwr.	6s	1949	90	87	93½
Sioux City Gas & Elec.	6s	1947	100	99	102
Sioux City Gas & Elec.	6s	1949	100	99	102
So. Caro. Gas & Elec.	6s	1942	87	87	93
So. Caro. Gas & Elec.	6s	1932	75	83	88
Southeast Pwr. & Lt.	6s	2025	97	96½	97½
So. Cal. Edison	5s	1939	99	99½	101
So. Cal. Edison	5s	1944	95	92½	96½
So. Cal. Edison	5½s	1944	101	98½	102
So. Cal. Edison	6s	1943	101½	100½	104
So. Cal. Edison	6s	1944	103½	102½	105½
So. Cities Utilities	5s	1931	98	100	102
Southern Colo. Power	6s	1947	98½	93½	99½
So. Public Utilities	5s	1943	97	97½	100½
So. Sierras Pwr.	6s	1936	102	102	104½
So. Utilities	6s	1933	100	97½	102½
So. Wisconsin Pwr.	5s	1938	89	88	93
Southwestern Gas & Elec.	5s	1932	96½	94	98
Southwestern Gas & Elec.	6s	1957	96	89	97½
Southwestern Pwr. & Lt.	5s	1943	94	90	97
Southwestern Pwr. & Lt.	6s	2022	92	88½	94½
Southwestern Utilities	8s	1936	97½	96	102
Springfield Ry. & Lt.	5s	1926	99	98½	100½
Standard Elec. of Cal.	5s	1939	98	98½	100½
Standard Gas & Elec.	6s	1935	99½	91	101
Staten Island Edison	6½s	1953	104	104	106½
Syracuse Ltg.	5s	1951	99½	97½	100½
Syracuse Ltg.	5½s	1954	101	100½	103
Tampa Elec.	5s	1933	*99	....	....
Tenn. Elec. Pwr.	6s	1947	102½	99½	104½
Tenn. Pwr.	5s	1962	93	90	96½
Tex. Pwr. & Lt.	5s	1937	98½	97	99½
Tex. Pwr. & Lt.	6s	2022	96	90	96½
Tide Water Pwr.	6s	1942	99½	98½	101
Tide Water Pwr.	7s	1937	98½	97½	101½
Tokio Elec. Pwr. (Japan)	7s	1955	89½	87	91½
Tokyo Elec. (Japan)	6s	1928	99	98½	99½
Toledo Edison	5s	1947	98½	97	100
Toledo Edison	7s	1941	109	108½	110
Toledo Gas Elec. & Htg.	5s	1935	96	97½	100½
Toledo Trac., Lt. & Pr.	5½s	19 0	98½	98	100½
Topeka Edison	5s	1930	97	97	100
Topeka Ry. & Lt.	5s	1933	95½	90½	96½
Trenton Gas & Elec.	5s	1949	98	98	100
Tri-City Ry. & Lt.	5s	1930	98	96½	99½
Twin State Gas & Elec.	5s	1953	93	84	94½
Tyrol Hydro-Elec. Pwr.	7½s	19.5	96½	94½	96½
Union Elec. Lt. & Pwr.	5s	1932	101½	99½	102
Union Elec. Lt. & Pwr.	5s	1933	99½	98½	101
Union Elec. Lt. & Pwr.	5s	1954	98½	97½	100
Union Elec. Lt. & Pwr.	5½s	1954	100½	100	104
United Elec. of N. J.	4s	1949	87	85	88½
United Elec. Lt. & Pwr.	4½s	1929	*98½	98½	99
United Gas & Elec.	6s	1945	97	96	101
United Lt. & Pwr. notes	5½s	1928	*98½	98	100
United Lt. & Pwr.	5½s	1959	94½	89½	97
United Lt. & Pwr.	6½s	1974	95½	92½	97½
United Lt. & Rys.	5s	1932	96	93½	97½
United Lt. & Rys.	6s	1926	99	100½	101½
United Lt. & Rys.	6s	1952	99	95½	100½
United Lt. & Rys.	6s	1973	89	87	92
United Pwr. & Lt.	6s	1944	101	99	103
Utah Lt. & Trac.	5s	1944	87½	87½	91½
Utah Pwr. & Lt.	5s	1944	94½	91	98½
Utah Pwr. & Lt.	6s	1944	102	102	104½
Utah Pwr. & Lt.	6s	2022	92	88½	94½
Utica Elec. Lt. & Pwr.	5s	1950	101½	100½	101½
Utica Gas & Elec.	5s	1957	101½	98½	103
Vermont Hydro-Elec.	6s	1929	99	98½	100½
Vicksburg Lt. & Trac.	5s	1932	90	89	93½
Virginian Pwr.	5s	1942	93½	88	96
Virginian Pwr.	6½s	1954	100	99	102½
Virginia Ry. & Pwr.	5s	1943	96½	93½	99
Wagner Elec. Mfg.	7s	....	*100½	100	102
Washington Coast Util.	6s	1941	101	99½	101½
Washington Wtr. Pwr.	5s	1939	101	99½	101½
West Penn Pwr.	5s	1963	98½	93½	99½
West Penn Pwr.	5s	1946	99½	93½	100
West Penn Pwr.	5½s	1953	104	100½	105½
West Penn Pwr.	7s	1946	106½	104½	107½
West Virginia Lt., Ht. & Pwr.	6s	1929	99½	95	100
West Virginia Utilities	6s	1935	96½	91	98
Westchester Ltg.	5s	1950	101½	98	102
Western Elec.	5s	1944	101	98	101½
Western N. Y. Utilities	5s	1946	94	90½	97
Western Pwr.	6½s	1954	100	97	100½
West. States Gas & Elec.	5s	1941	97	95	99½
West. States Gas & Elec.	6s	1947	98	97	100½
Westinghouse Elec. & Mfg.	7s	1931	106½	103½	108½
Wisconsin Elec. Pwr.	5s	1954	98½	93½	99½
Wisconsin Gas & Elec.	5s	1952	98	97	100½
Wis.-Minn. Lt. & Pwr.	5s	1944	95	93	96½
Wis. Ry., Lt. & Pwr.	5s	1933	92½	87½	93½
Wis. River Pwr.	5s	1941	90	88	92½
Yadkin River Pwr.	5s	1941	98	96½	99½
Yarmouth Lt. & Pwr.	5s	1937	83	82	87
Yarmouth Lt. & Pwr.	8s	1951	98	97	102

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco. tBid price, low, high, Sept. 29. jLatest quotations available.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

New England Industry Still Presents a Large Field for Future Central-Station Development



A Task Worthy of New England

AMONG the greatest blessings which can come to mankind is a task to be done—not a task which can be achieved along easy lines that the mere thought of accomplishment clearly indicates, but a task which calls forth all the potential energy and brain power within the human engine. Such a task and its successful accomplishment raise man to a pinnacle of joy and contentment and make life worth the living. The future would be drab and dreary indeed did it not hold within its grasp a task of such proportions as to test the mettle of a man's mental and physical capacity. The accomplishments of the past are dead—the scene of a brilliant pageant after the passing of the actors. It is the future and its possibilities upon which the eyes of red-blooded men are focused today

The fact that the industries of New England are only 58.7 per cent electrified and that private electric generating plants furnish considerably more than one-third of the energy used in the factories of that section is in no way a cause for discouragement and bemoaning by the central-station industry of the states concerned, but a cause rather for rejoicing in the anticipation of future accomplishment. If all industry were completely electrified and the domestic field completely saturated electrically, then the future of the central-station industry in New England, from the standpoint of the enthusiastic worker, would be sad indeed.

The accompanying diagrams indicate that there is a large field open for the development of the industrial load in New England, reflecting thereby a bright future for the central-station industry in that section. The total gross revenue of the central-station industry in New England during 1924 was $116,000,000 and there is every reason to believe that the revenue will be increased by $40,000,000 by 1930. Of course, this is a small figure as figures go today, but it represents nevertheless a growth of 35 per cent for the six-year period, very probably a greater financial growth than will be experienced by any other primary industry in New England.

Increased consumption of electrical energy for industrial heating purposes, new residential and industrial power customers taken on the lines, increased use of electrical appliances and the increased use of radio in the home all contribute to the growth of almost two billion kilowatt-hours in the central-station output which may be expected of New England during the next five years. The central-station industry in that section is spending $54,000,000 this year for additions and extensions to its generation, transmission and distribution equipment, and a total of $375,000,000 will be spent during the present decade for such expansion.

A task worthy the steel of a great industry lies before the central-station companies of New England. How well they meet this test will be told in the years to come.

Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers of the ELECTRICAL WORLD to quote for use these statistics for any legitimate purpose. While there is no requirement that the source of data be given, yet it would help the ELECTRICAL WORLD in obtaining and compiling further basic information if those who make use of these statistics would give credit to the ELECTRICAL WORLD.

Building Construction and Central-Station Growth

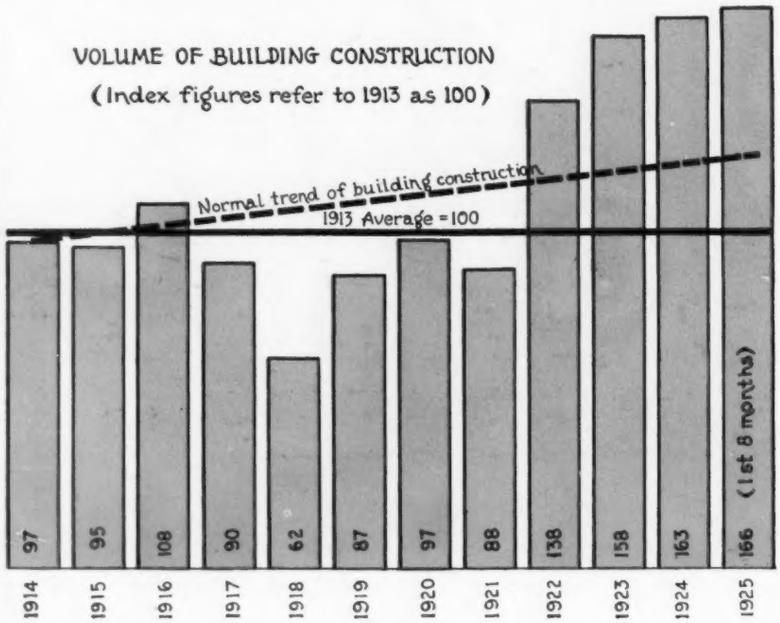
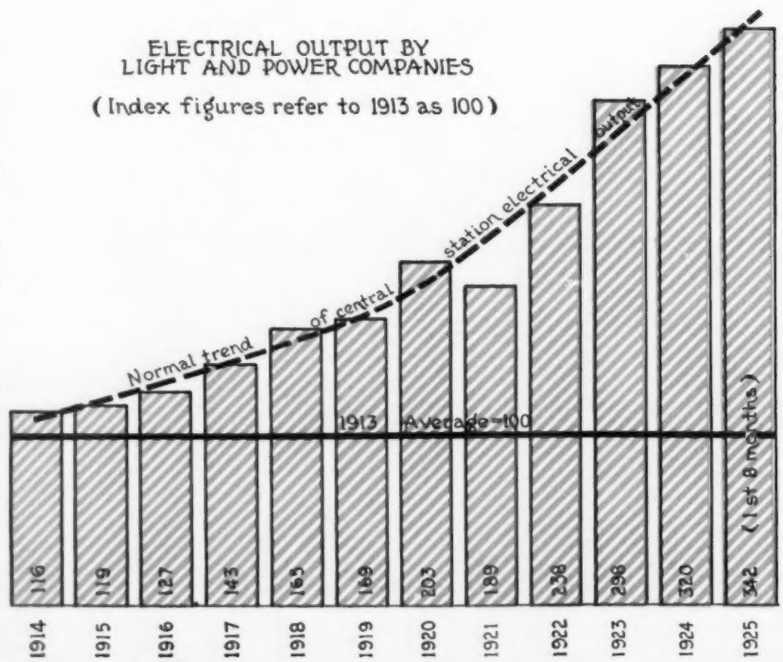
IN ALL human relations complete isolation is an impossibility, and this applies to economic relations as well. The theory of isolation, that greater economic advancement is possible through the sole consideration of self, has long been exploded. Conversely, the activities of any one institution are very largely influenced by the activities of many others. A high degree of prosperity in any line of human endeavor reflects the interest of humanity at large.

The activities to which is due the progress of the electric light and power industry are specially sensitive to general economic conditions, although the service rendered by the industry has so intertwined itself into the home and industrial life of the nation that it would take a national calamity indeed to seriously cripple activity. The industry has not put all her eggs in one basket, as is clearly evidenced by the fact that during the general industrial depression of 1921, when almost all primary industries were reporting greatly decreased revenue as a result of decreased manufacturing activities, the electric light and power industry reported a record revenue.

Among the many basic factors underlying the marvelous progress of the electric light and power industry, especially since the war, building construction has played a very conspicuous part. Domestic and commercial building was materially below the estimated normal construction from 1917 through 1921. This subnormal construction activity resulted in a serious shortage of both domestic and commercial structures. The tide turned during the summer of 1921, since which time building construction has been far above the estimated normal. Many students of the building industry feel that the domestic and commercial housing shortage has now been wiped out and that the industry will soon fall back to the normal trend of construction. A study of the accompanying diagrams seems to support this general opinion. The normal trend in building construction is fairly well defined, and it would appear that the cumulative abnormal volume of construction since 1921 has exceeded the accumulated deficiency in construction from 1917 to 1921.

What effect this expected flattening out of the building construction curve will have on the future growth of the electric light and power industry is problematical. It is certain to decrease materially the number of new domestic and commercial lighting customers taken on the lines annually; but it was hardly to be expected that the taking on of over two million customers each year, as in 1923 and 1924, could last indefinitely. There is an economic limit to any type of growth.

Such a probability does not, however, in any way mean that the electric light and power industry has reached its peak of operations or has even sighted such a limit of activity. Today industry as a whole is only approximately 60 per cent electrified, and of that portion which is electrified only 62 per cent is served by central-station lines, leaving approximately 61 per cent of industry as a potential field for the development of the central-station load. In addition new industrial applications for electrical energy are being discovered at frequent intervals. The use of energy in the home is increasing every day as the housewife becomes more and more educated in the use of electrical appliances. The placing of hundreds of thousands of radio receiving sets on the central-station lines will be a consummation of the near future, as was evidenced by the keen interest taken both by the industry and the general public in this type of receiving set at the recent Radio Exposition in New York City. Railroad electrification is but in its infancy, and the farm is a potential field pregnant with large possibilities for the future.

The industry will meet the problem when it comes as it has met all other problems—with increased energy and far-sighted organization, thereby continuing the industry on its upward road of progress.

Comparative Long-Time Activities in the Building Constuction and Central-Station Industries